COMPARATIVE STUDY OF EFFICACY OF DIATHERMY INCISION VERSUS SCALPEL INCISION IN PATIENTS UNDERGOING LICHTENSTEIN HERNIOPLASTY

A DISSERTATION SUBMITTED TO
THE TAMILNADU DR.MGR MEDICAL UNIVERSITY
In partial fulfillment of the regulations for the award of the

Degree of M.S(GENERAL SURGRY)

BRANCH-1

DEPARTMENT OF GENERAL SURGERY

STANLEY MEDICAL COLLEGE AND HOSPITALS,

TAMILNADU DR.MGR MEDICAL UNIVERSITY, CHENNAI

APRIL 2015

DECLARATION

*I Dr.KUDIYARASU.M solemnly declare that this dissertation titled "**COMPARATIVE STUDY OF EFFICACY OF DIATHERMY INCISION VERSUS SCALPEL INCISION IN PATIENTS UNDERGOING LICHTENSTEIN HERNIOPLASTY**" is a bona fide work done by me in the deparment of general surgery,Govt.stanley medical college and hospital,Chennai under the supervision of*

PROF* Dr *P.DARWIN, ***PROF* Dr R.V.SURESH,**

***PROF* Dr T.S.JAYASHREE,** *and*

my head of the department

***PROF* Dr *S.VISWANATHAN*.**

This dissertation is submitted to the tamilnadu DR MGR medical university ,Chennai in partial fulfilment of the university regulations for the award of M.S degree(general surgery),branch-1 examination to be held in April 2015.

September 2015 **DR.KUDIYARASU.M**
Chennai.

CERTIFICATE

*This is to certify that the dissertation entitled "**COMPARATIVE STUDY OF EFFICACY OF DIATHERMY INCISION VERSUS SCALPEL INCISION IN PATIENTS UNDERGOING LICHTENSTEIN HERNIOPLASTY**" is a bona fide work done by DR.KUDIYARASU.M post graduate(2012-2015) in the department of general surgery, Govt .stanley medical college and hospital,Chennai under my direct guidance and supervision, in partial fulfillment of the regulations of the TAMILNADU DR.MGR MEDICAL UNIVERSITY Chennai for the award of M.S degree(General surgery) Branch-1 examination to be held in April 2015*

***PROF* Dr.T.S. JAYASHREE M.S**	***PROF* Dr.S.VISWANATHAN M.S**
Professor of surgery	*Professor and head of surgery*
Dept.of general surgery	*Dept.of general surgery*
Stanley medical college	*Stanley medical college*
Chennai 1	*Chennai 1*

PROF DR.A.L. MEENAKSHI SUNDARAM M.D
The Dean
Stanley medical college
Chennai 1

COMPARATIVE STUDY OF EFFICACY OF DIATHERMY INCISION VERSUS SCALPEL INCISION IN PATIENTS UNDERGOING LICHTENSTEIN HERNIOPLASTY

A DISSERTATION SUBMITTED TO
THE TAMILNADU DR.MGR MEDICAL UNIVERSITY
In partial fulfillment of the regulations for the award of the

Degree of M.S(GENERAL SURGRY)

ACKNOWLEDGEMENT

I am grateful to the Dean PROF DR.AL.MEENAKSHI SUNDARAM for permitting me to conduct the study and the resources of the college.

I consider it a privilege to have done this study under the supervision of my beloved professor and head of the department of General Surgery

PROF DR.S.VISWANATHAN,who has been a source of constant inspiration and encouragement to accomplish this work.

I am highly indebted to my Chief PROF DR.P.DARWIN,

PROF DR.R.V.SURESH, PROF DR.T.S.JAYASHREE, Professors of General Surgery for their constant help,inspiration and valuable advice in preparing this dissertation.

I express my deepest sense of thankfulness to my Assistant Professors

DR. C.ARUNBABU ,DR D.S.KUMARESAN, for the valuable inputs and constant encouragement without which this dissertation could not have been completed.

I am grateful to the Head of the department, Radiology PROF.DR.C.AMARNATH and PROF DR.SATHYAN, for permitting me to use the resources of the department.

I express my sincere thanks to my fellow post graduates and junior colleagues for their support and help in completing this dissertation.

It is my earnest duty to thank my family without whom accomplishing this task would have been impossible.I am extremely thankful to my patients who consented and participated to make this study possible.

LIST OF ABBREVATIONS

AC-Alternate Current

Cm – Centimeter

CW-Continuous Wave

DC-Direct Current

DF- Degrees of freedom

EC- Electrocautery

i.e- that is

h/o- History of

MF-Medium Frequency

No – Number

OOK- On and Off keys

pod – Postoperative day

PR- Pulse Rate

BP- Blood Pressure

SC- Scalpel

Sec – Second

t - student's t test

Vol – Volume

X2- Chi square test

ABSTRACT

Background:

Electrocautery in surgery is widely used except for the skin incisions ,this is because of fear of scarring of tissues, post operative pain, and wound infection in view of devitalisation of tissues. This study compares the scalpel incisions with electrocautery incision over skin in patients undergoing hernia repair.

Materials And Methods:

In this study prospective randomized study 60 patients undergoing mesh repair for inguinal hernia are divided in to two groups . in Group A skin incision is taken with electrocautery, and in Group B incision is taken with scalpel. Postoperative pain , wound complication and requirement of analgesic are compared between the two groups. The results are finally analyzed and compared for the two groups using Mann-Whitney U Test.

Results:

The two groups did not differ in relation to post operative pain . Post operative analgesic requirement are similar in two groups and post operative complications seroma, hematoma ,purulent collection are comparable in two groups.

Conclusion:

Although results are comparable in two groups ,electrocautery can be safely used in making skin incisions as results are comparable in two groups .We recommend further broad study of electrocautery usage in other surgical procedure and its further evaluation.

Key words: electrocautery, scalpel, skin incision.

LIST OF CONTENTS

INTRODUCTION

Incision is a cut or slit to gain access to underlying structures . Cauterization is a medical term describing burning of body to remove or close a part of it. Electrocautery is used increasingly for tissue dissection, although fears of excessive scarring and poor wound healing have curtailed its widespread use for skin incision. Traditionally incisions are made with stainless steel scalpel. These incisions are supposed to be more bloody and painful . To overcome this problem many advanced techniques have come viz, , laser and cavitron electron surgical aspirator but the cost of above said methods are costly and relatively unavailable in peripheries.

Electrocautery which is available in all surgical theaters is less frequently used for skin incisions for

the fear of tissue damage, fear of post operative pain and scarring.

Recent advances and studies have shown that electrocautery can be used for skin incision without any postoperative complications like wound infection and scarring and less post operative pain .

This study is undertaken to alleviate the fear of using electrocautery for skin incisions in surgical community.

AIM AND OBJECTIVES

To evaluate and compare the post operative pain and post operative complications in electrocautery incision and scalpel incision over skin in patients undergoing Lichtenstein hernioplasty.

REVIEW OF LITERATURE

HISTORICAL ASPECTS

The Electrosurgical device is first developed commercially by Dr.William T. Bovie, between 1914 to 1927 when he was working in Harvard University.On October 1, 1926 , Dr. Harvey Williams Cushing used first an electrosurgical generator for performing a surgery.

ELECTROCAUTERY

Electrosurgery's working principle is similar to the heating coil of the electric toaster .When a voltage is applied,it generates current flow and this leads to rise in temperature of the material (like the tissue in the electrosurgery).

When electrosurgery is performed, the tissue is applied with a voltage source . This leads to a flow of an electrical current.A

simple electrical circuit is formed between the tissue and the voltage source, where the tissue acts as a resistor. The current flow is determined by the resistance of the tissue :

$$I = \frac{V}{R}$$

The above relationship is called as Ohm's law.Flow of Current in a resistor leads to the production of heat. The heat thus produced, leads to the damage of the tissue.

To put simply, the resistance of the tissue is the reason , the electrical energy gets converted into heat (thermal energy) which ultimately leads to the rise in tissue temperature .

Heat produced = Electrical energy expended.

The electrical power (energy per time) expended and can be calculated using:

$$P = I \cdot V = I^2 \cdot R = \frac{V^2}{R}$$

where P symbolises the electrical power, and which is measured in watts. This result gives us the heat production rate (heat produced per unit time).

Then what is the reason behind, the electrode not getting heated up? The answer to this is that the resistance of the metal is very much lesser than the tissue and very little electrical power is expended in the metal conductors. This is the same principle behind why a toaster gets very much heated up, where as the power cord doesn't get heated up .

In electrosurgery, a specialized electronic instrument is used as The voltage source . This is usually referred to as an *electrosurgical generator*.

Rise in Temperature

When an object is heated there is a change in temperature.This change in temperature is inversely proportional to its heat capacity; the heat that is needed, is directly proportional to the mass of the object.For example if two objects of the same material but of different sizes is considered, a large quantity of heat is needed to raise the temperature of the larger of the two objects by (to say) one degree. Also, when a smaller region is heated, the temperature of this particular region will rise much higher when compared to the heat that is evenly distributed over the whole object.

current density

Current density is nothing but a measure to the concentration of electrical current. When current density

increases,there will be increased generation of heat.This shows that temperature rise in the tissue is directly proportional to the current density in that area..

Frequency of the electricity

The steadily flowing electrical current is called as DC current.The frequency is measured in hertz. So this has 0 hz.Whereas, an electrical current with varying flow is called as AC current and this has one or more hz.

The nervous system of the human body is very sensitive to low-frequency (0 Hz to about 1000 Hz) electricity, which is because the nervous system is by itself a complex web of electrical circuits. On Applying low-frequency electricity the nervous system gets stimulated. At even low currents low-frequency electricity causes electric shock which can involve acute pain, muscle spasms, and/or cardiac arrest.To be noted is

that, the sensitivity of the nervous system to electricity is decreased on increasing frequency.So, electricity does not stimulate the nervous system when the frequency is above 100kHz.

To prevent electric shock, electrosurgical equipments are operated in the frequency range of 200 kHz to 5 MHz.

Common Electrosurgical modalities

Monopolar and Bipolar modalities

In Electrosurgery,the widely used *modalities* are *monopolar* and *bipolar*. The *bipolar modality* is the one that is used less often, but it is easier to be explained.In this modality the patient is applied with a Voltage using a specialised forceps, where both the tines are connected to separate pole of the voltage source.

During Electrosurgery, a high frequency electrical current is allowed to flow from one tine of the forceps to the other tine, passing through the tissue.At this high frequencies, the direction of the current alternates, but heating takes place irrespective of which direction the current flows. In this manner, the intervening tissue gets heated up.

Whereas in the *monopolar modality* the patient is made to lie on the *return electrode*,which is nothing but a metal plate or a metalized plastic pad.This pad is connected to the other electrode of the A.C. current source.In Electrosurgery, a single, pointed, probe is used by the surgeon in order to make contact with the tissue. The electrical current is allowed to flow from the tip of the probe, through the body and then to the returning electrode.From this the electrical current flows back to the electrosurgical generator.

One might think that the monopolar modality may cause heating of the entire body.But what one notice is that, the heating is actually very precisely confined only to the tissue which is nearer to the tip of the probe. This is because the current as it is entering the body gets rapidly spreaded out.This results in a considerable reduction in the current density.

Since there is a increased current density near to the tip when compared to that of the body or surface return electrode, the heating takes place in that localized region, that is only near the tip of the probe.

One have to be cautious with this modality on an extremity such as a finger or penis.Upon using this modality there is a resulting high current density because, there is a minimal cross

sectional area for the returning current to spread across.This results in heating of the whole volume of the extremity.This may lead to the necrosis of the entire extremity.So due to this reason, it must be avoided in circumcision.

Prevention of unintended burns in anesthetized patients

In Electrosurgery under anaesthesia the *monopolar modality* needs a large area of electrical contact between the body (that is back of the patient) and the returning electrode.When this amount of proper contact is not established, it may lead to severe burns (3rd degree) in unintended areas on the patients skin and also beneath the skin.

In order to prevent this kind of unintended burns, the skin is to be cleaned , dried.Then a conductive jelly is to be applied to enhance the contact between the plate and the skin.The electrical wiring of the theatre should be good. Circuit interruption alarms are highly recommended in newer electrosurgical units.

A Surgeon with special training in Electrosurgery are allowed to use these kind of modalities.

Electrosurgical waveforms

There are various waveforms that are currently in use in electrosurgical procedures. For tissue cutting purposes, sine wave with a continuous single frequency is generated. This leads to the production of rapid heating. At the microscopic level, this rapid heating leads to boiling and bursting of tissue cells.When looked at the larger scale, this rupturing of cells lead to the tissue tear, making a clean incision.

For the tissue coagulation purposes, there is a turning on and off of the sine wave in a very rapid successive manner.. This leads to a slower heating process, which makes the cells to coagulate.The heating rate can be controlled by altering the proportion of on time to off time.There is a parameter called duty cycle,which is defined as the ratio of the on time to the period (the time of a single on-off cycle).

scalpel

A scalpel is the very sharp knife that is used in surgical and anatomical dissection. Scalpels are either disposable or re-usable. Re-usable scalpels are the ones which may have either attached, resharpenable blades or, non-attached, replaceable blades. Whereas Disposable scalpels have a plastic handle with an extensible blade.These blades used once are discarded entirely.

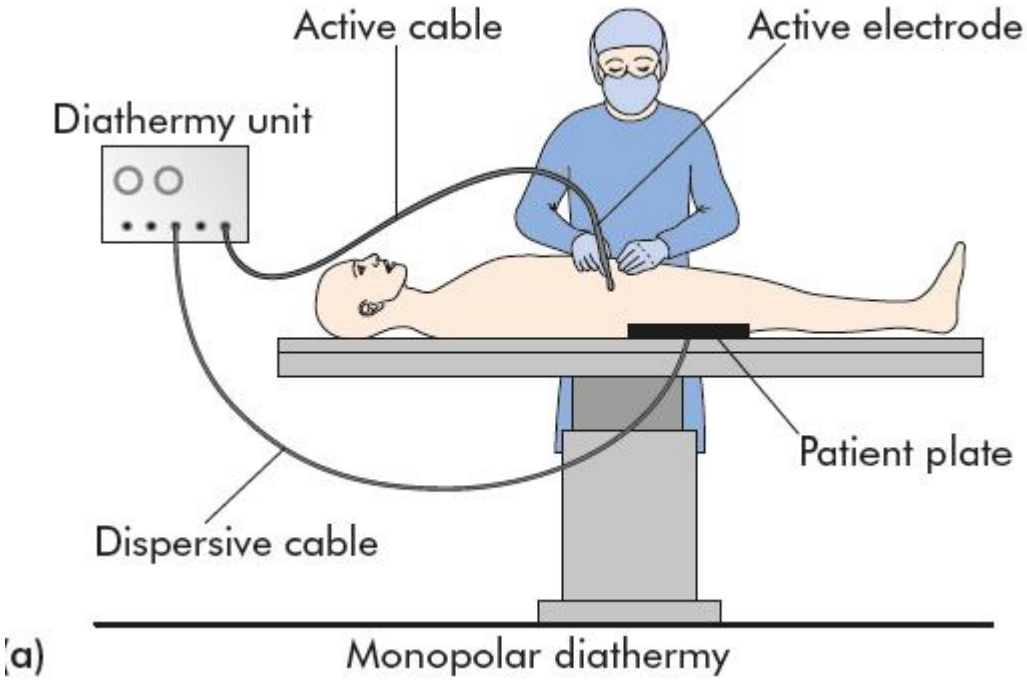
Scalpel blades are commonly made of hardened and tempered steel. Medical blades are made of440c stainless steel, while craft blades can be made of high carbon steel; in addition , blades are also made of titanium, ceramic, diamond, which are very expensive.Also For instance, if the surgery is to be performed under MRI guidance, one cannot use metallic blades ,because the steel blades will be drawn towards the magnets or it may create

image artifacts.Here comes the compelling need for the alternatives to scalpels which may include electrocautery and lasers.

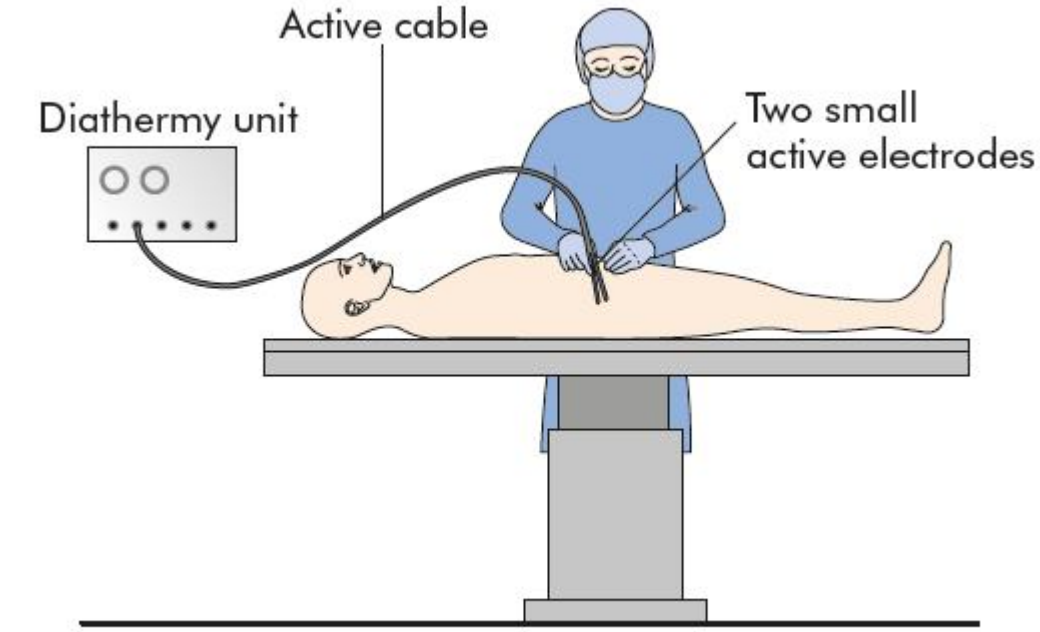
There are two parts in Surgical scalpels,which include a blade and a handle.

Most commonly used are the Reusable scalpels with handles and replaceable blades. There are two basic types of Medical scalpel handles. One is a flat handle, that is used in the #3 and #4 handles. The other one is rounded at the front and flat at the back that is seen in #7 handle. A #4 handle is larger than a #3.Only some blades can be fitted in both handles, whereas many others are too large or small and can be fitted either of the one .

The principles of diathermy



(a) Monopolar diathermy



b) Bipolar diathermy

Figure 1. Electrocautery machine

Figure 2 Electrocautery scalpel

Figure 3: Scalpel

THE LENGTH AND DIRECTION OF THE INCISION

The incision should be planned in a proper manner and should be conveniently lengthy enough to afford good exposure.Following are the things that should come in mind of the surgeon before deciding upon the direction of the incision,

-The healing of the wound takes place from side to side not from end to end.

-In the dissecting area, the arrangement of tissue fibres may vary according to the tissue type.

-One can achieve a good cosmetic results if incisions are made in parallel to the dirction of the tissue fibres.But depending on the tissue involved the results may vary.

DISSECTION TECHNIQUE

The incision should be made in a single stroke by applying even pressure with the scalpel.Then the tissues should be cut by Sharp dissection.Blood vessels, muscles, nerves should be preserved as far as possible.

TISSUE HANDLING —

Tissue handling plays a vital role in tissue healing. Tissues should be handled very gently and as minimum as possible. Lesser trauma to the tissue leads to faster wound healing.One should place the retractors carefully.More pressure can lead to impairment of blood flow, lymphatic drainage and may predispose to infection.

HEMOSTASIS —

Hemostasis plays a major role in dissection in any surgery. It helps the surgeon to have a clear field and to dissect the tissues in good accuracy. There are many number of methods to achieve hemostasis. They are mechanical, thermal, and chemical methods. When hemostasis is not achieved, the field may be interfered by the blood and the surgeon cannot have a clear view of the structures. Complete hemostasis should be secured before closing the wound. This may prevent the formation of hematoma. The hematoma if formed may become the interference of wound opposition. And may act as a source of infection.

Care must be taken during a vessel ligation , and larger amount of tissue should not be clamped in an attempt to ligate a vessel. This may lead to tissue damage. This may lead to tissue necrosis and death. This may predispose delayed wound healing..

GROIN

The groin is the region between thigh and abdomen.

Superficial fascia of anterior abdominal wall

Below the level of the umbilicus,

it divides into

a) fascia ofCamper (superficial fatty layer)

b) fascia of Scarpa (deep membranous layer).

Fascia of camper continues as superficial fascia of adjacent part of the body.

Dartos muscle replaces this fascia in scrotum.

Fascia of scarpa becomes colle's fascia which is the membranous layer of the perineum.

Attachments are:

(a) Pubic tubercle

(b) Holden's line –starts slightly lateral of pubic tubercle , ends upto 8cm

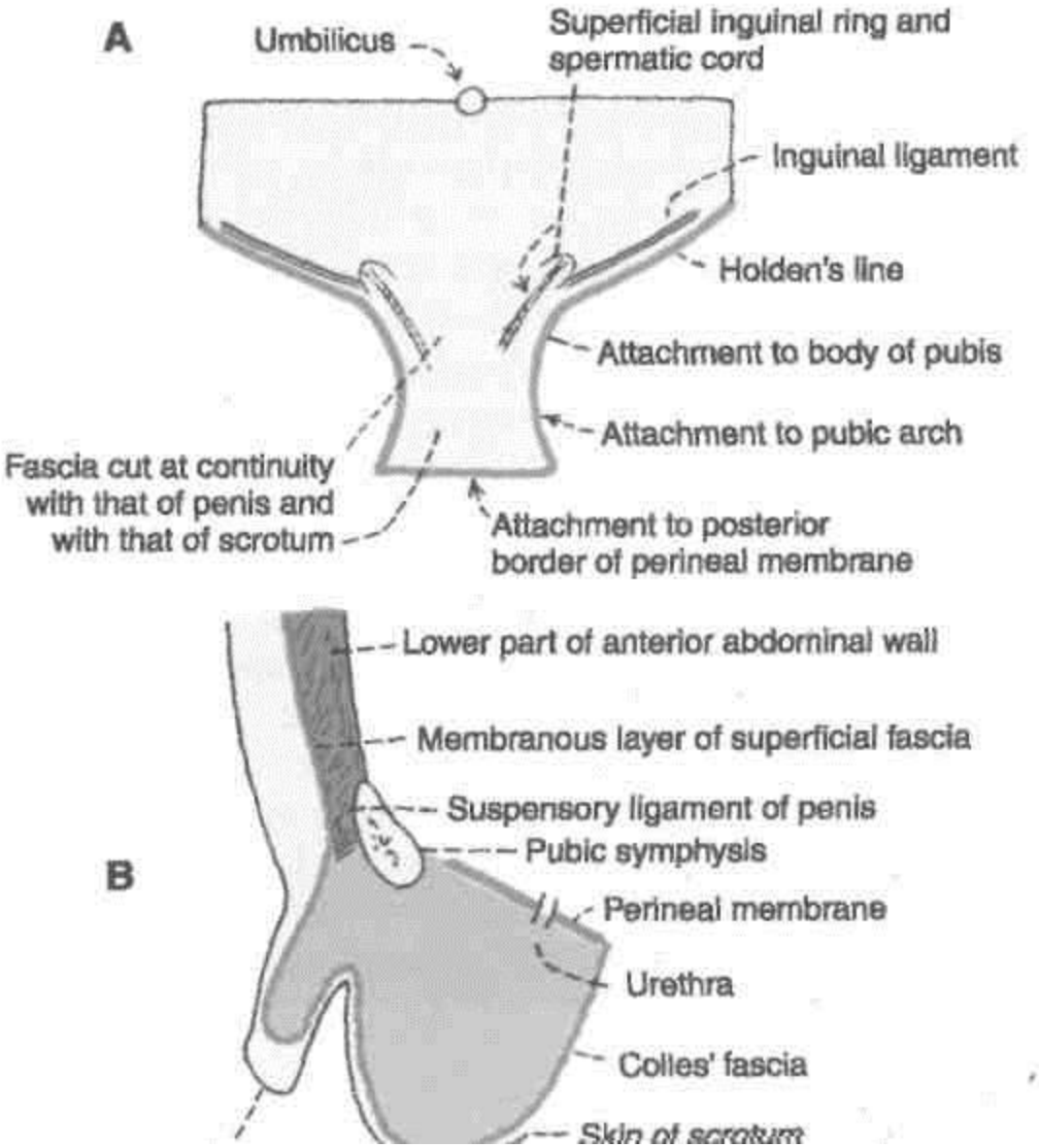
(c) Pubic arch

(d) Body of the pubis

(e) The posterior border of the perineal membrane.

Above the umbilicus - the membranous layer joins with fatty layer.

The extent and attachments of the membranous layer of superficial fascia of the abdomen and perineum in a male. (A) Anterior view; (B) in sagittal section.



The fascia contains:

(a) fat

(b) superficial lymphatics;

(c) cutaneous nerves

(d) cutaneous vessels

Cutaneous Nerves

The skin of the anterior abdominal wall is supplied by the lower six thoracic nerves and by the first lumbar nerve in the following manner. The anterior cutaneous nerves (seven in number) are derived from the iliohypogastric nerve,lower five intercostal nerves and the subcostal nerve. T7-T12 nerves pierce the anterior wall of the rectus sheath close to the median plane, divide into medial and lateral branches and supply the skin of the front of the abdomen. They are arranged in serial order; T7near the xiphoid process, T10 at the level of umbilicus, the iliohypogastric nerve 2.5 cm above the superficial inguinal ring, and others at proportionate distances between them.

The terminal part of the ilioinguinal nerve emerges through the superficial inguinal ring, pierces the external spermatic fascia and descends to supply the skin of the external genitalia and the upper part of the medial side of the thigh.

The lateral cutaneous nerves are two in number and are derived from the lower two intercostal nerves . Each nerve pierces the external intercostal i muscle and divides into a large anterior branch and a smaller posterior branch, both of which emerge between the lower digitations of the external oblique muscle and supply the skin of the side of the abdomen. The larger anterior branches also supply the external oblique muscle.

The lateral cutaneous branches of the subcostal and iliohypogastric (T12, LI) nerves descend over the iliac crest and supply the skin of the antero-superior part of the gluteal region.

Cutaneous Arteries

1. The anterior cutaneous arteries are branches of the superior and inferior epigastric arteries, and accompany the anterior cutaneous nerves
2. The lateral cutaneous arteries are branches of the lower intercostal arteries, and accompany the lateral cutaneous nerves.
3. These superficial inguinal arteries arise from the femoral artery and supply the skin of the lower abdomen.

    The superficial epigastric artery runs upwards and supplies the skin up to the umbilicus.

    The superficial external pudendal artery passes in front of the spermatic cord, and supplies the skin of the external genitalia and the adjoining part of the lower abdominal wall.

    The superficial circumflex iliac artery runs laterally just below the inguinal ligament and supplies the skin of the abdomen and thigh.

Cutaneous Veins

The veins run along with the arteries. Superficial inguinal veins drain into the great saphenous vein.

LYMPHATIC DRAINAGE

Above the level of the umbilicus the lymphatics run upwards to drain into the axillary lymph nodes.

Below the level of the umbilicus they run downwards to drain into the superficial inguinal lymph nodes.

MUSCULATURE OF ANTERIOR ABDOMINAL WALL

The anterior abdominal wall is made up mainly of muscles. On either side of the midline there are four large muscles. These are the external oblique, the internal oblique, the transversus abdominis and the rectus abdominis. Two small muscles, the cremaster and the pyramidalis are also present.

The external oblique, the internal oblique and the transversus abdominis are large flat muscles placed in the anterolateral part of the abdominal wall. Each of them ends in an extensive aponeurosis that reaches the midline. Here the aponeuroses of the right and left sides decussate to form a median band called the linea alba.

The rectus abdominis runs vertically on either side of the linea alba. It is enclosed in a sheath formed by the aponeuroses of the flat muscles named above.

External Oblique Muscle

Origin –from middle of lower eight ribs

Then run downwards, forwards and medially

Insertion -

1. Most of the fibres of the muscle end in a broad aponeurosis through which they are inserted from above downwards into the xiphoid process, the linea alba, the pubic symphysis, the pubic crest and the pectineal line of the pubis

2. The lower fibres of the muscle are inserted directly into the anterior two-thirds of the outer lip of the iliac crest.

Nerve Supply - Lower six thoracic nerves.

Internal Oblique Muscle

Origin

The muscle arises from :

a. The lateral two-thirds of the inguinal ligament .

b. The anterior two-thirds of the intermediate area of the iliac crest, and

c. The thoracolumbar fascia

From this origin the fibres run upwards, forwards and medially crossing the fibres of the external oblique muscle at right angles.

Insertion

1. The uppermost fibres are inserted directly into the lower three or four ribs and their cartilages.

2. The greater part of the muscle ends in an aponeurosis through which it is inserted into the seventh, eighth and ninth costal

cartilages, the xiphoid process, the linea alba, the pubic crest and the pectineal line of the pubis .

Nerve Supply

Lower six thoracic nerves and the first lumbar nerve.

Transversus Abdominis Muscle

Origin

The muscle has a fleshy origin from :

a. The lateral one-third of the inguinal ligament.

*b. The anterior two-thirds of the inner lip of the Ujac crest.

c. The thoracolumbar fascia (Fig. 24.11).

d. The inner surfaces of the lower six costal cartilages. The fibres are directed horizontally forwards.

Insertion

The fibres end in a broad aponeurosis which is inserted into the xiphoid process, the linea alba, the pubic crest, and the pectineal line of the pubis.

The lowest fibres of the muscle fuse with the lowest fibres of the internal oblique to form the conjoint tendon.

Nerve Supply

Lower six thoracic nerves, and first lumbar nerve.

Rectus Abdominis Muscle

Origin

The muscle arises by two tendinous heads as follows:

a. Lateral head from the lateral part of the pubic crest

b. Medial head from the anterior pubic ligament. The fibres run vertically upwards.

Insertion

On the front of the wall of the thorax, along a horizontal line passing laterally from the xiphoid process, and cutting in that order, the 7th, 6th and 5th costal cartilages.

Nerve Supply

Lower six or seven thoracic nerves.

Inguinal Ligament

Lower margin of external oblique aponeurosis becomes thick and turns back to form the inguinal ligament

Extension- anterior superior iliac spine to the pubic tubercle.

It lies beneath the fold of the groin. Its lateral half is rounded and oblique. Its medial half is grooved upwards and is more horizontal.

Attachments *:*

(a) The fascia lata is attached to the lower border. Traction of this fascia makes the ligament convex downwards,

(b) The upper surface of the ligament gives origin to the internal oblique from its lateral two-thirds, to the transversus abdominis from its lateral one-third, and to the cremaster muscle from its middle part.

Relations :

The upper grooved surface of the medial half of the inguinal ligament forms the floor of the inguinal canal and lodges the spermatic cord or round ligament of the uterus.

Conjoint Tendon or Falx Inguinalis

The conjoint tendon is formed by fusion of the lowest aponeurotic fibres of the internal oblique and of the transversus *muscles, and is attached* to the pubic crest and to the medial part of the pecten pubis.

Medially, it is continuous with the *anterior wall of the* rectus sheath.

Laterally, it is usually free.

Sometimes it may be continuous with an inconstant ligamentous band, named the interfoveolar ligament, "which, connects the lower border of the transversus abdominis to the superior ramus of the pubis.

The conjoint tendon strengthens the abdominal wall at the site where it is *weakened* by *the* superficial inguinal ring

Cremaster Muscle

The cremaster muscle consists of muscle fasciculi embedded in the cremasteric fascia. The fasciculi form loops that are attached laterally to the inguinal ligament. Here some fibres may be continuous with the internal oblique or transversus muscles. The medial ends of the loops are attached to the pubic tubercle, the pubic crest or the conjoint tendon.

Along with the intervening connective tissue, the muscle loops to form a sac like cremasteric fascia around the spermatic cord and testis. It lies deep to the external spermatic fascia.

Nerve Supply -Genital branch of the genitofemoral nerve [L1]

Action

The cremaster helps to suspend the testis and can elevate it. The muscle also tends to close the superficial inguinal ring when the intra-abdominal pressure is raised.

Cremasteric Reflex

Upon stroking the skin of the upper part of the medial thigh, there is contraction of the cremaster muscle, as evidenced by elevation and retraction of the testis. The reflex is more brisk in I children. In upper motor neuron lesions above segment LI, the reflex is lost.

FASCIA TRANSVERSALIS

The fascia that lies beneath the transverse abdominis is called fascia transversalis.

Extent

Anteriorly, it is adherent to the linea alba above the umbilicus.

Posteriorly, it merges with the anterior layer of the thoracolumbar fascia and is continuous with the renal fascia.

Superiorly, it is continuous with the diaphragmatic fascia.

Interiorly,

(a) it is attached to the inner lip of the iliac crest and to the lateral half of the inguinal ligament, at both these places it is continuous with the fascia iliaca;

(b) medially, it is attached to the pubic tubercle, the pubic crest and the pectineal line,

(c) part of it is prolonged into the thigh as the anterior wall of the femoral sheath.

Opening of Deep Inguinal Ring

About 1.2 cm above the midinguinal point there is an oval opening in the fascia transversalis. This opening is the deep inguinal ring .

The ring lies immediately lateral to the inferior epigastric artery.

It transmits the spermatic cord in males, and the round ligament of the uterus in females.

Prolongations

1. A tubular prolongation of the fascia transversalis surrounds the spermatic cord forming the internal sperma tic fascia.

2. Over the femoral vessels, the fascia transversalis is prolonged into the thigh as the anterior wall of femoral sheath.

Relation to Vessels and Nerves

The main arteries of the abdominal wall and pelvis lie inside the fascia transversalis, while the main nerves are outside. That is why the femoral vessels are inside the femoral sheath, while the femoral nerve is outside the sheath.

INGUINAL CANAL

Definition

Its an oblique canal that is present above the medial half of the inguinal ligament.

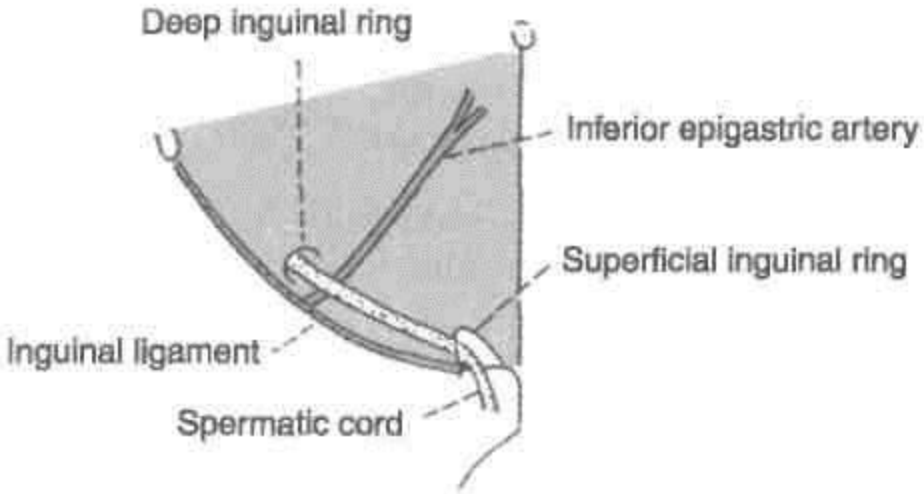
Length and direction: It is about 3.5 cm to 4 cm and is directed forwards, medially and downwards.

Extension- extends from the deep inguinal ring to the superficial inguinal ring.

DEVELOPMENT OF INGUINAL CANAL

Inguinal canal represents the passage of *gubernaculum* through the abdominal wall; it extends from the caudal end of the developing gonad (in lumbar region) to the *labioscrotal swelling.*

In early life, the canal is very short. As the pelvis increases in width, the deep inguinal ring is shifted laterally and the adult dimensions of the canal are attained.



Superficial and deep inguinal rings.

Sex Difference

The inguinal canal is larger in males than in females.

Structures Passing through the Canal

1. The spermatic cord in males, or the round ligament of the uterus in females

2. The ilioinguinal nerve

Mechanism of Inguinal Canal

The presence of the inguinal canal is a cause of weakness in the lower part of the anterior abdominal wall. This weakness is compensated by the following factors.

1. Obliquity of the inguinal canal: The two inguinal rings do not lie opposite each other. Therefore, when the intra-abdominal pressure rises the anterior and posterior walls of the canal are approximated, thus obliterating the passage. This is known as the flap valve mechanism.

2. The superficial inguinal ring is guarded from behind by the conjoint tendon and by the reflected part of the inguinal ligament.

3. The deep inguinal ring is guarded from the front by the fleshy fibres of the internal oblique.

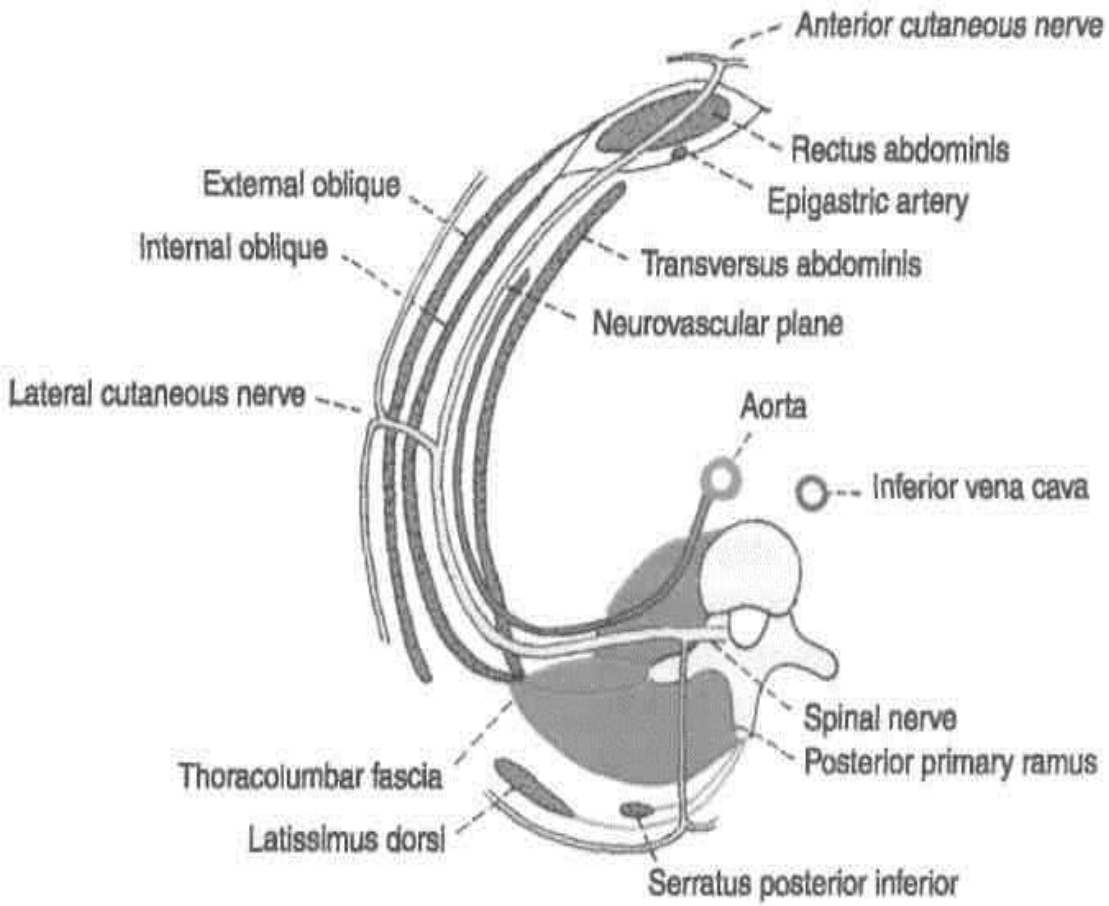
4. Shutter mechanism of the internal oblique: This muscle has a triple relation to the inguinal canal. It forms the anterior wall, the roof, and the posterior wall of the canal. When it contracts the roof is approximated to the floor, like a shutter. The arching fibres of the transversus also take part in the shutter mechanism.

5. Contraction of the cremaster helps the spermatic cord to plug the superficial inguinal ring [ball valve mechanism).

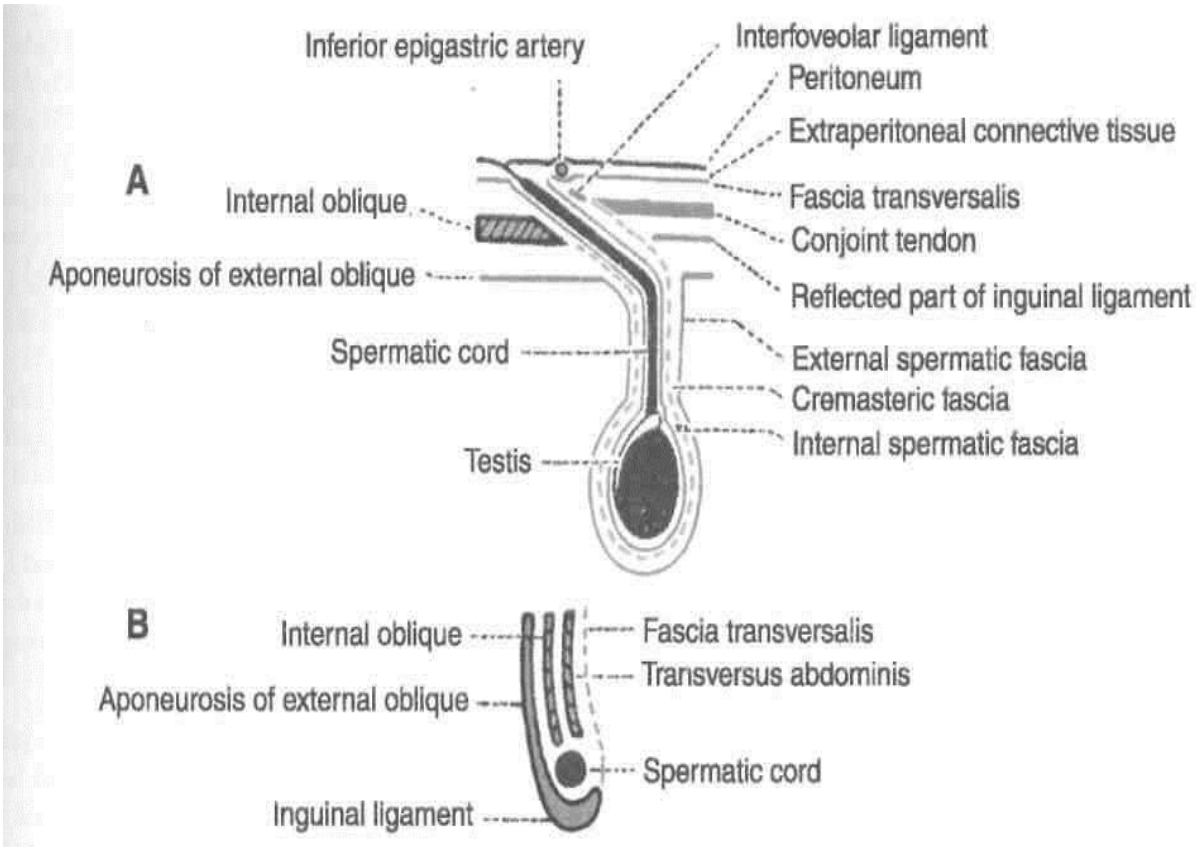
6. Contraction of the external oblique results in approximation of the two crura of the superficial inguinal ring (slit valve mechanism). The integrity of the superficial inguinal ring is greatly increased by the intercrural fibres.

7. Hormones may play a role in maintaining the tone of the inguinal musculature.

Whenever there is a rise in intra-abdominal pressure as in coughing, sneezing, lifting heavy weights all these mechanisms come into play, so that the inguinal canal is obliterated, its openings are closed, and herniation of abdominal viscera is prevented.



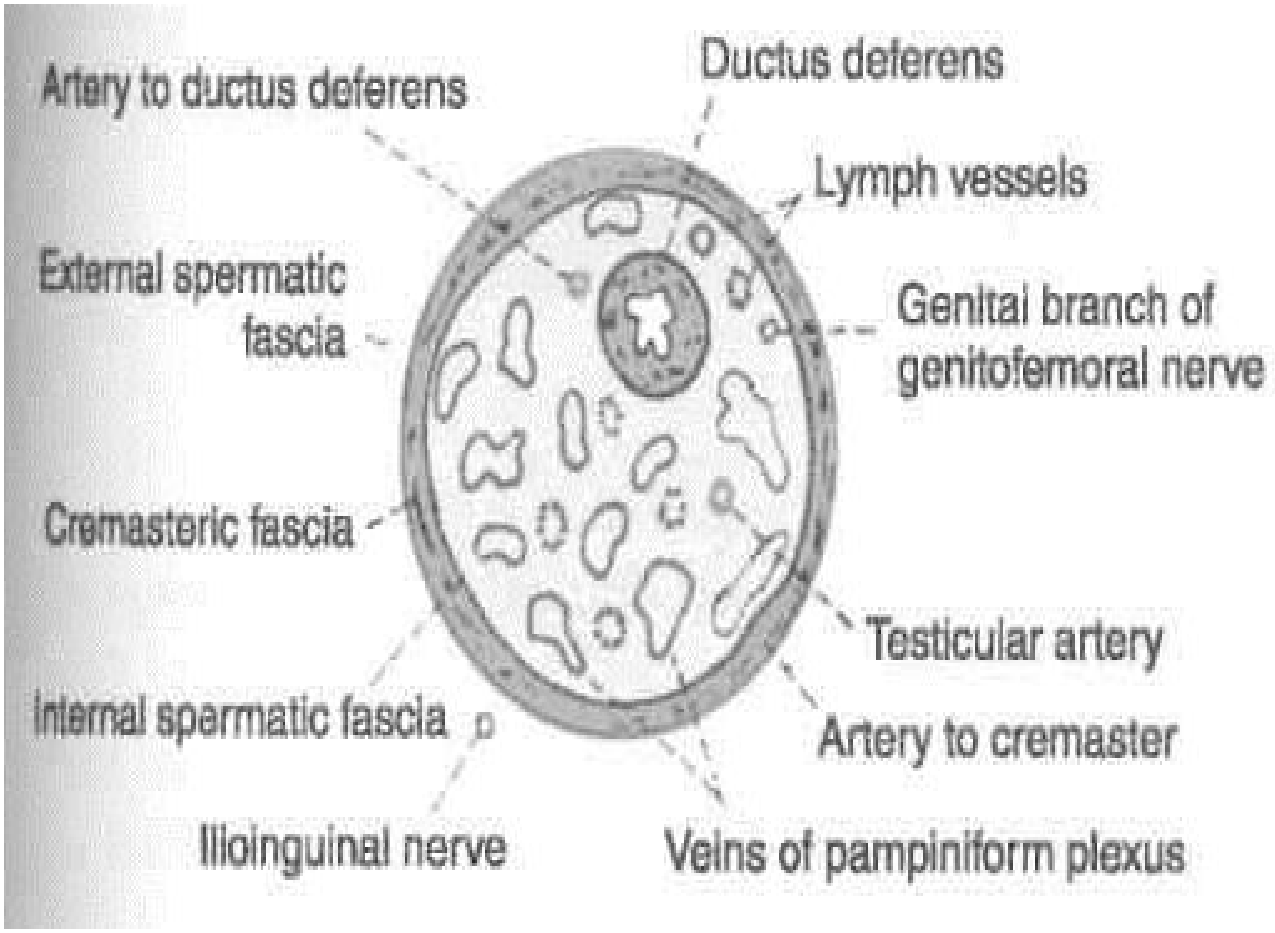
Transverse section through the lumbar region showing the abdominal wall musculature and neurovascular plane



Boundaries of the inguinal canal:

A) Anterior and posterior walls in horizontal section

B) Roof and floor in sagittal section



Contents of the spermatic cord

Hesselbach's triangle

Direct inguinal hernia occurs through the weaker part of anterior abdominal wall known as Hesselbach's triangle .

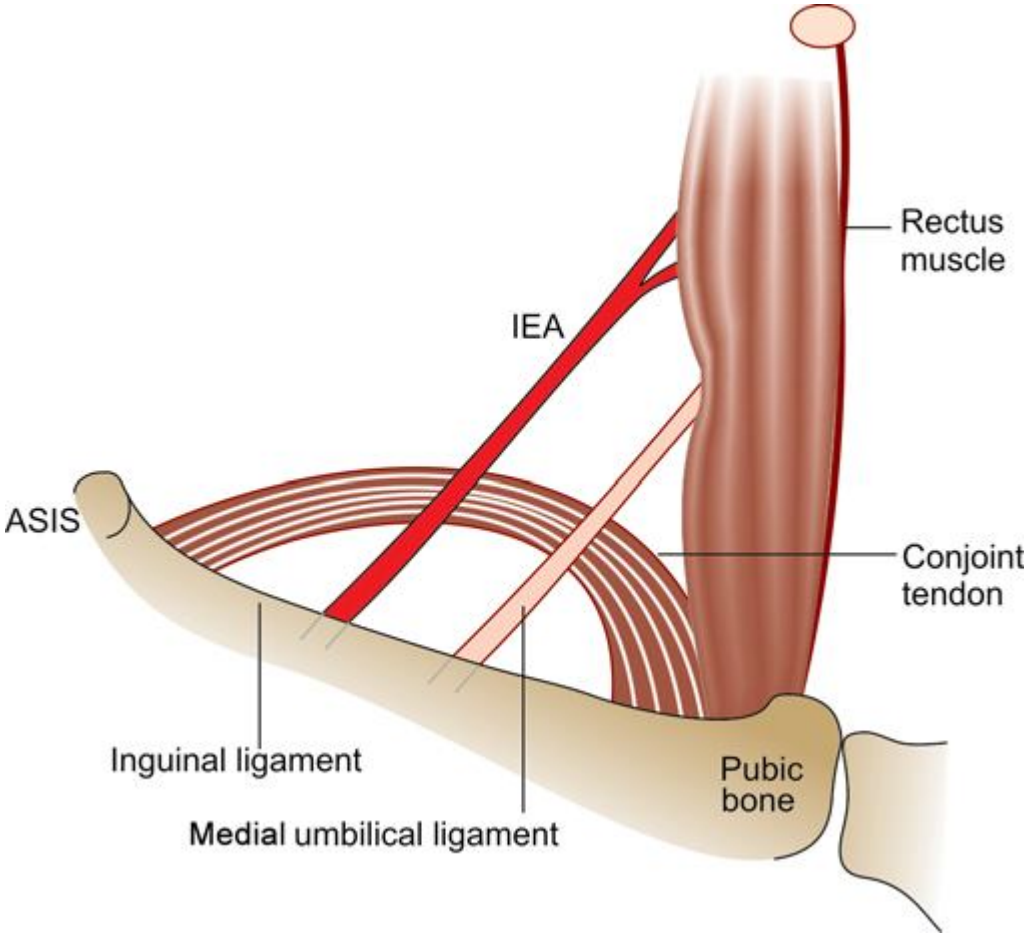
Boundaries are

1) Medial border - lateral margin of rectus abdominis muscle

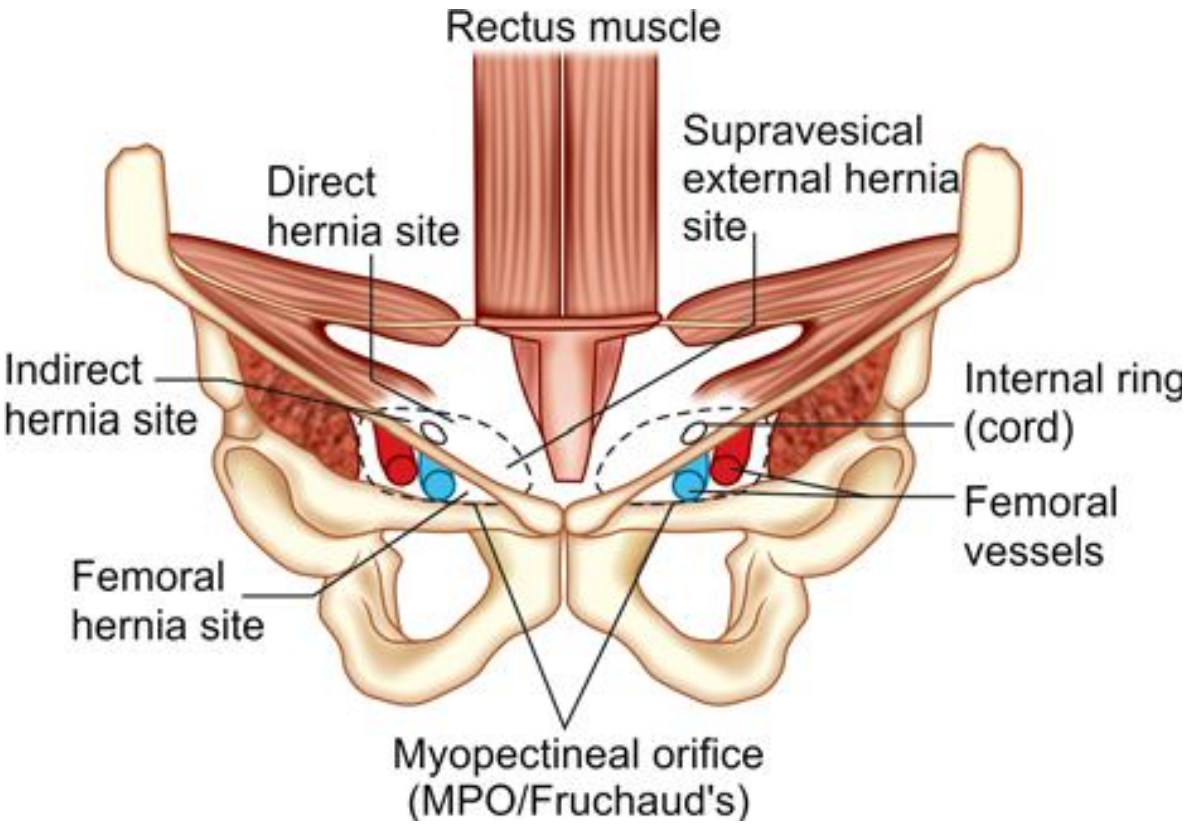
2) Lateral border - inferior epigastric vessels

3) Inferior border - medial part of inguinal ligament.

Fascia transversalis forms the floor of the hesselbach's triangle.



Surgical anatomy of Hesselbach's triangle



Surgical anatomy of myopectineal orifice

CLASSIFICATION OF INGUINAL HERNIA

(EARLIER)

Classification I

Anatomical Classifi cation (in Inguinal Hernia)

1. **Indirect hernia**

It comes out through internal ring along with the cord. It is lateral to the inferior epigastric artery.

2.Direct hernia

It occurs through the posterior wall of the inguinal canal through 'Hesselbach's triangle' (bounded medially by lateral border of rectus muscle, laterally by inferior epigastric artery, below by inguinal ligament). Sac is medial to the inferior epigastric artery.

Classification II

According to the Extent

1.Incomplete:

Bubonocele:

Here sac is confined to the inguinal canal.

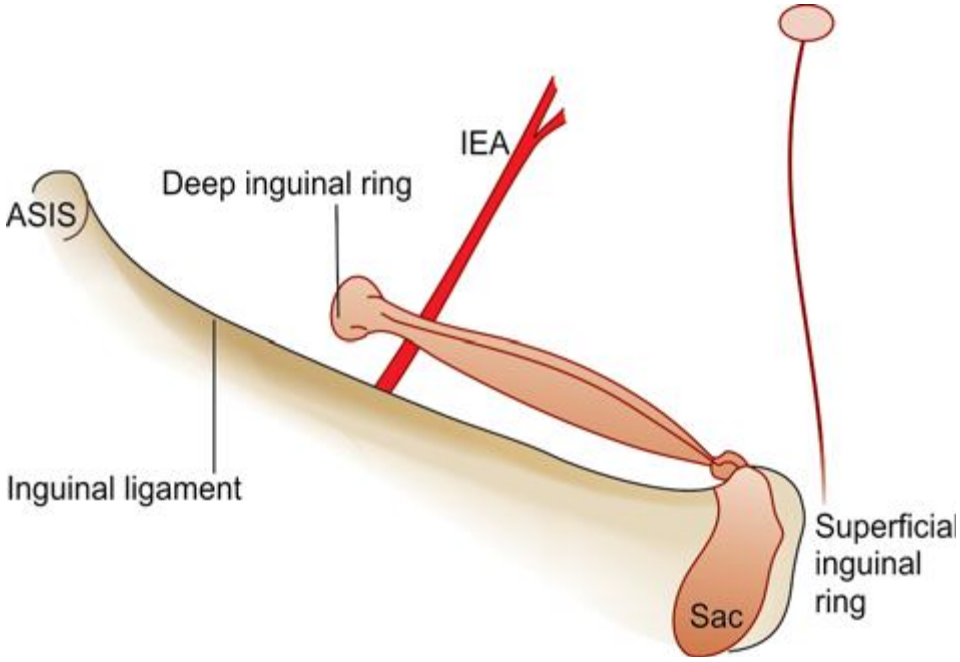
Funicular:

Here sac crosses the superficial inguinal ring. Processus vaginalis is closed just above the epididymis. Contents of the sac can be felt separately from testis, which lies below the hernia.

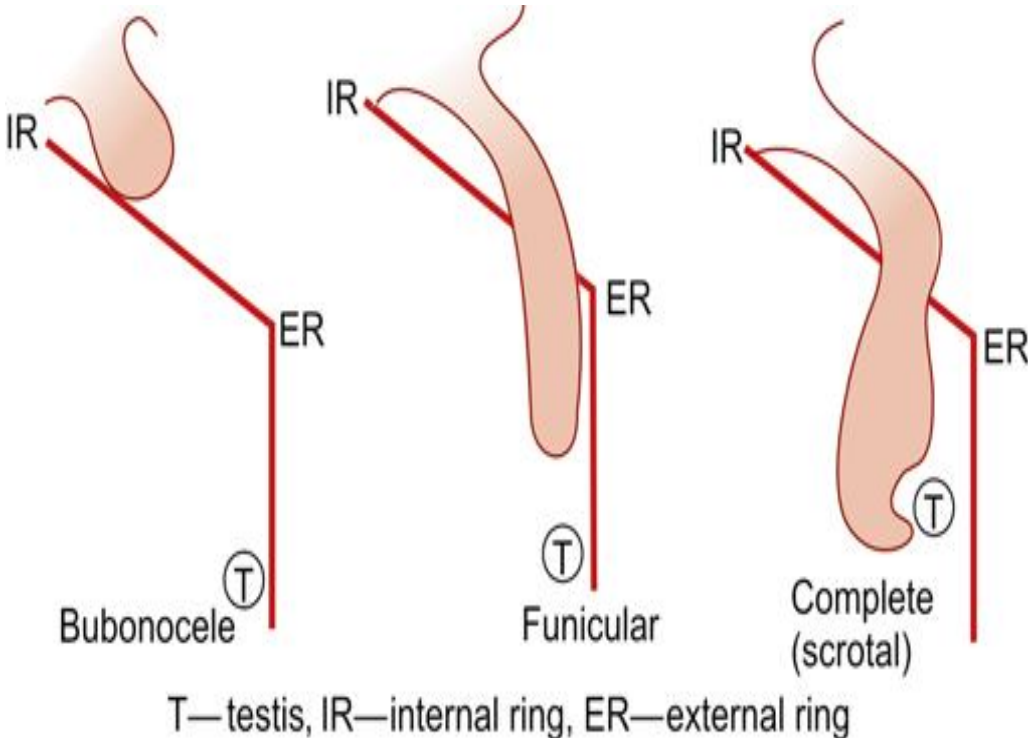
2.**Complete**:

Here sac reaches the lower part of the scrotum. Testis appears to lie within the lower part of hernia. It can occur in any age group. It occurs in a congenital preformed sac (processus vaginalis). More commonly contents descend into the pre-existing sac, only when there are precipitating causes which force the content down.

Saddle-bag or pantaloon hernial sac has got both medial and lateral component.



Surgical anatomy of indirect inguinal hernia



Types of indirect inguinal hernia.

HERNIOPLASTY

Lichtenstein introduced tension free hernioplasty in 1984.

It is herniotomy and reinforced repair of post wall of the inguinal canal by filling the gap between the conjoined tendon and inguinal ligament by either autogenous material or heterogeneous material.

Indications of hernioplasty-

1) indirect hernia- with decreased muscle tone
2) direct hernia
3) recurrent hernias

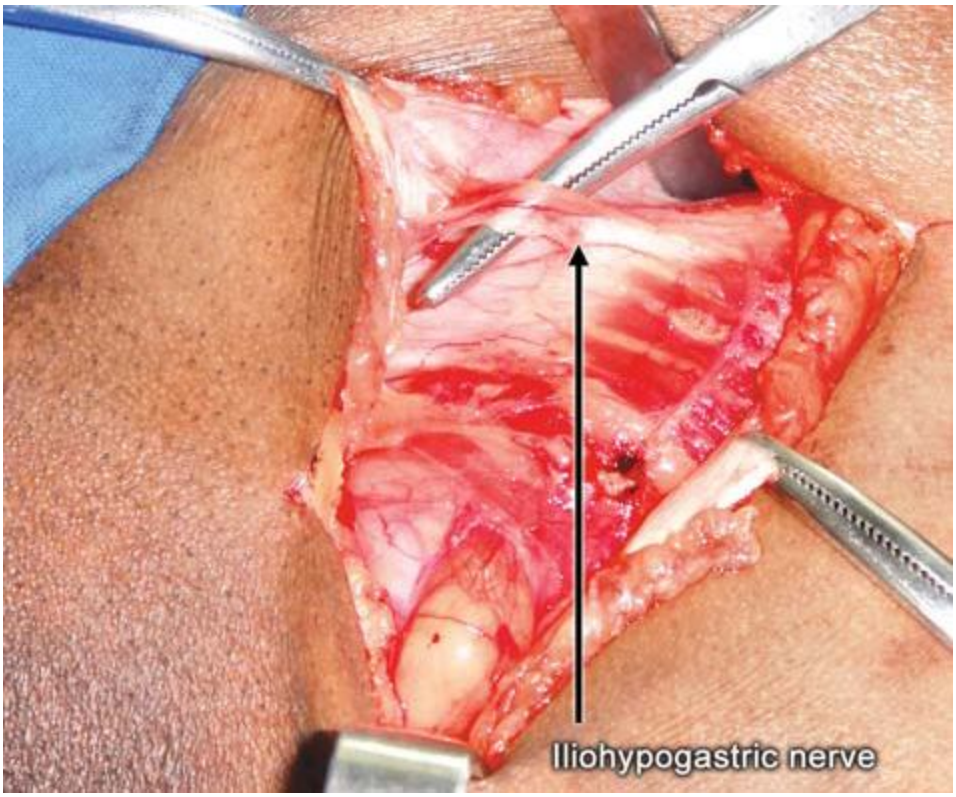
LICHTENSTEIN TENSION – FREE

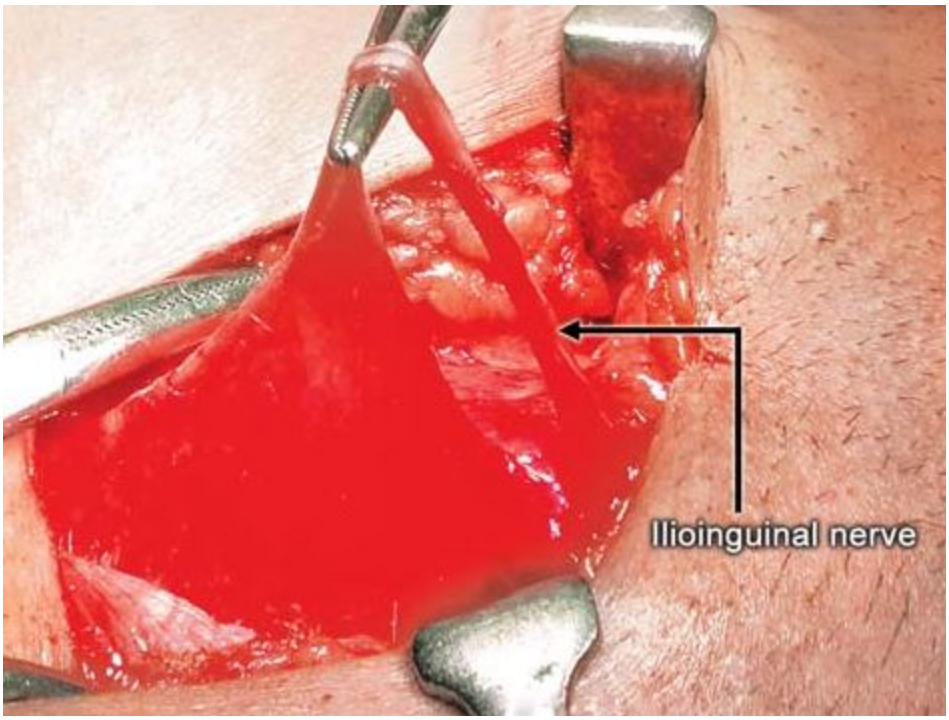
OPERATIVE PROCEDURE

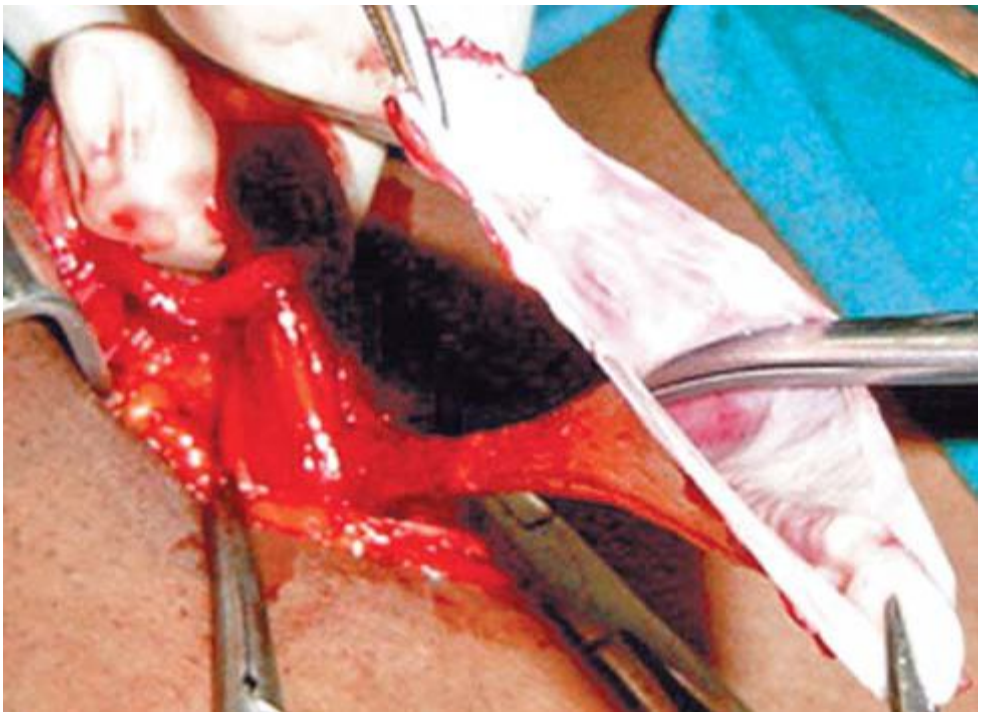
An incision is made 1.25 cm above and parallel to inguinal ligament extending from pubic tubercle upto 1 cm lateral to mid point of inguinal ligament. skin, subcutaneous tissue, external oblique aponeurosis opened in layers. Cremaster, cremastric fascia, internal spermatic fascia opened. Indirect sac is identified anterolateral to the cord, and dissected from the cord structures. Indirect sac opened and contents reduced. Sac is double ligated at the level of neck and excess sac is excised. Lytle's repair done.

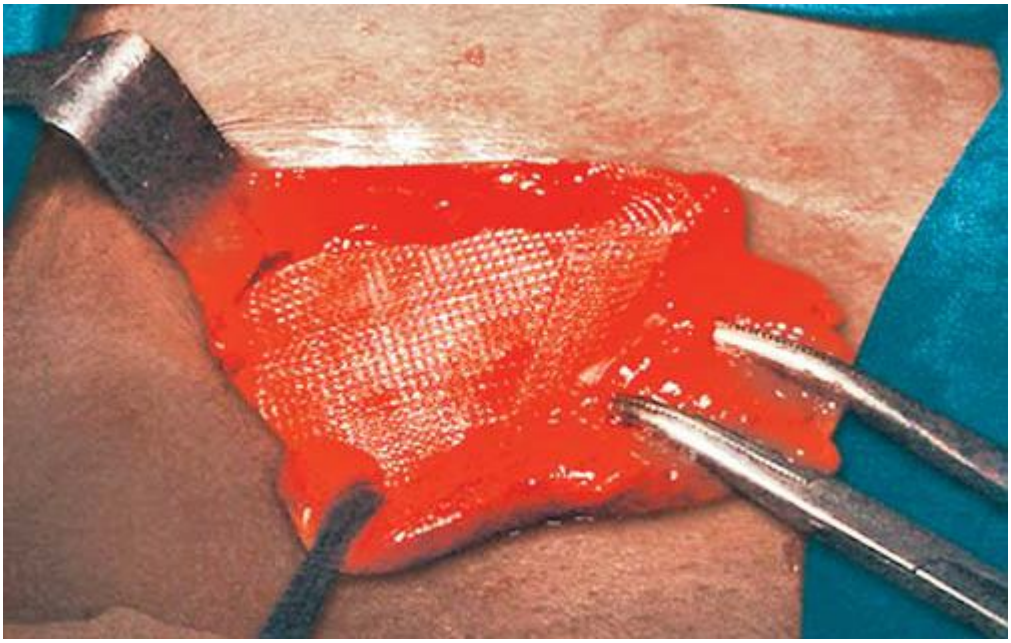
If there is direct hernia, the sac is reduced by taking bites from the transversalis fascia with absorbable sutures.

Non absorbable Mesh of size 6*11 cm is placed over the posterior wall by taking bites from the pubic tubercle, inverted portion of inguinal ligament,conjoint tendon with non absorbable sutures.Wound is closed in layers.Sterile dressing applied.scrotal bandage applied.


Iliohypogastric nerve


Ilioinguinal nerve





COMPLICATIONS OF INGUINAL HERNIA REPAIR

(I)Wound infection

Bacterias commonly involved are –

Staphylococcus aureus

Staphylococcus Epidermidis[18]

Group A streptococcus[19]

E-coli[20]

Clinical presentation

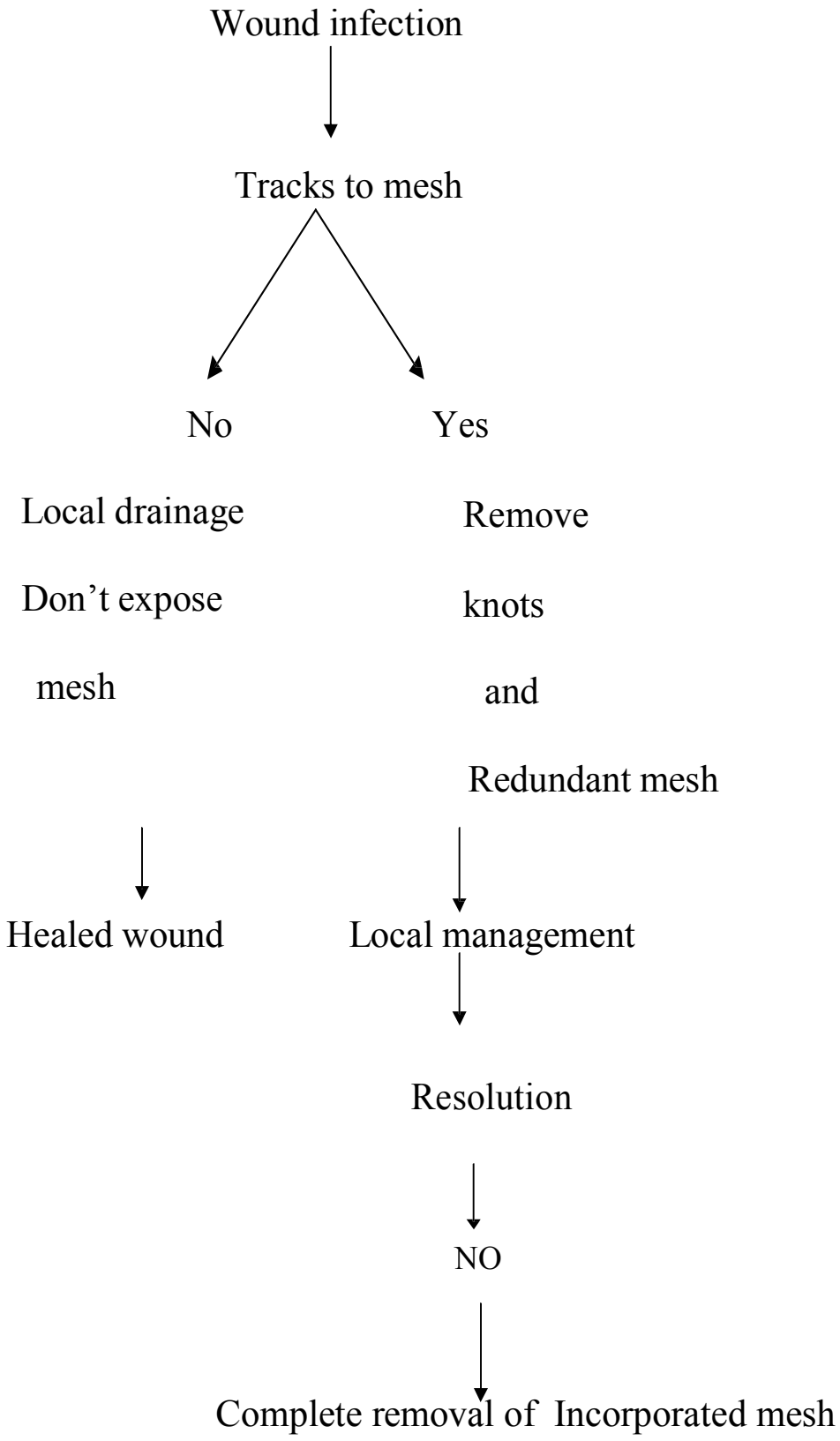
– Fever, pain and signs of inflammation around infected area.

Treatment –

1) If a localized area of infection- drainage of pus

2) If extensive area of infection- requires opening of wound / debridement with antibiotics depending on culture sensitivity

3) If case of infected mesh-


Wound infection
Tracks to mesh
No
Yes
Local drainage
Don't expose
mesh
Remove
knots
and
Redundant mesh
Healed wound
Local management
Resolution
NO
Complete removal of
Incorporated mesh

Other complications

1) Hydrocele

2) Hematocele

3) Complications involving vas deference

   (a) Dysejaculation syndrome

   (b) Transsection of vas

4) Nerve injuries - Commonly genitofemoral involved.

5) Damage to blood vessels of testicles

6) Ischemic orchitis and testicular atrophy

7) Testicular pain

8) Infertility

Chronic pain after inguinal herniorrhaphy - classified as

(a) **Nociceptive**

1) Somatic

2) Visceral dysejaculation

(b) **Neuropathic**

1) Neuroma pain

2) Projected pain

Historical Review of studies on electrocautery:

Several studies are under taken to compare electrocautery incision with scalpel incision. Brief revive of studies are mentioned below.

Study in department of general surgery Sher E Kehir institute of medical sciences Srinagar. ,it was a prospective study , 240 female patients undergoing cholecystectomy were randomized in to two groups A and B , Group A skin incision with scalpel and in Group B skin incision with electrocautery , following variables were observed ,

Comparison of pain score after 24 hrs of surgery

Pain score	Group A	Group B
0 absent	2(16)	17(14.1)
1 mild	60(50)	92(76.6)
2 moderate	43 (35.8)	10(8.3)
3 severe	15(12.5)	1(0.8)
Mean (SD)	1.59(0..7)	0.96(0.51)

Results of pain assessment at 24 hr post surgery shows significantly less pain was appreciated in group B , total mean analgesic injections required were 3.09

COMPARISION OF WOUND COMPLICATION

Complication	Group A	Group B	P value
Hematoma	14 (11.6)	3 (2.5)	>0.5
Seroma	16 (13.3)	5(4.1)	>0.5
Sepsis	3(2.5)	4(3.3)	>0.5

Wound hematoma and seroma are more in group A but difference is not statistically significant.

No cases of wound disruption after 6 weeks were observed

In this study they have concluded that electrosurgical incision are quite safe and significantly less painful and produce cosmetically better scar .they recommends wider use of electrocautery and further evaluation of study .

Study in Royal College of surgeon Ireland , by S.R.Kerans et al , they studied diathermy verses scalpel incion in patients undergoing midline laparotomy incision , analysed

Patient demographs

	Scalpel	Diathermy
No of patients	50	50
Mean age	61(15-84)	60(32- 85)
Sex (M:F)	27:23	27:23

Preoperative demography

	Scalpel	Diathermy	P
Incision (sec)	509	4 69	0.36
Wound (mm)	78.8	86.4	0.3
Blood loss (ml)	105.5	64.4	0.003
Incision time (sec/m2)	7.5(0.5)	6.1(0,4)	0.04

Post operative pain

	Scalpel		diathermy	
Pain score	Mean	median	mean	median
Day 1	2.7(0.1)	3(1-4)	2.3	2
Day 2	2.4 (0.1)	2.4(1-4)	2(0.1)	2
Day 3	1.9(0.1)	2(1-3)	1.6(1-3)	2
Day 4	1.4(0.1)	1(0-3)	1.3(0.1)	2
Day 5	1.2(0.1)	1(0-2)	1.1(0.1)	2

Wound complication

No significant difference in wound complication

In **conclusion** they mentioned , incision with diathermy is faster , less blood loss , lower post operative pain , no significant difference in wound and post operative complication

Chyoss.E et al compared diathermy and scalpel incision in tension free inguinal hernioplasty at department of general surgery in university hospital Herakhion Greece . Total 125 patients undergoing hernioplasty were randomized in to ether scalpel (n -60) or diathermy (n-57) groups , 8 had bilateral 5 of them allotted scalpel group and 3 to diathermy group.

Parameters measured included blood loss during skin incision , and underlying tissue dissection,post operative pain and requirement of analgesics , presence of wound dehiscence and wound infection i.e on day of discharge , on day of stapler removal and after 1 month.

Results are analysed and found that blood loss is minimal and amount did not differ between two groups,

Diathermy group received less analgesics, no difference were noted in wound strength , infections are totally absent in both groups.

In **conclusion** they mentioned skin incision with diathermy is safe as the use of scalpel in terms of wound healing and reduces the analgesic requirements in post operative period..

B .Sheik et al , neuro surgery department king Faisal university Saudi Arabia ,performed a study stating safety and efficacy of electrocautery incision for skin opening in neurosurgery.

Total 177 patients for neurosurgical procedures have been performed using micro needle electrosurgical and steel scalpel incision.

Results of the study were stated that blood loss is less with electrocautery incision , only two patients had wound infection and dehiscence and all other had normal wound healing.

The study recommends use of electrocautery for neurosurgical procedures to incise skin whenever blood loss is expected .

P.N.Mekaet al, compared the superiority of electrocautery over scalpel incision in various abdominal surgeries . study included 60 patients , age ranged from 15 to 60 years , patients are randomized into two groups electrocautery group and scalpel group for a various abdominal incisions like flank incisions , kochers incision and midline incision . compared for blood loss , time taken , wound infection , and cosmetic appeal.

In the study they have found that less blood loss , less pain score, and less time for incision in electrocautery group . post operative wound infection were comparable in two groups . cosmetic appeal is superior in electrocautery group .

In **conclusion** they have stated that electrocautery incision are easily learned , highly effective technique and associated with lesser complications . Study recommends use of electrocautery incision over skin.

Franchi M et al , department of obstetrics and gynecology, university of Insubria ,Italy performed study on use of cold scalpel and electrocautery for midline abdominal incision .

In this study patient undergoing midline laparotomies for malignancy are divided in to two groups according to method used to perform abdominal midline incision with scalpel or diathermy TOTAL 964 patients are included in the study

531 scalpel group

433 electrocautery group

Univariate analysis done for analysis of results . higher incidence of wound complication in scalpel group , 8 of scalpel group and 1 from electrocautery group , but after adjusting confounding variables (age, BMI) no difference is found between two groups

In **conclusion** of study they stated that choice of incision is surgeon's preference since no difference between two groups.

Stolz .A. J . et al performed study titled- Is scalpel required for thoracotomy ? , study was conducted at Motol ,Prana.

In this study total 73 patients are randomized in to two groups , scalpel group and electrocautery group , all wound complications are divided in to

Grade 1 – induration and erythema

Grade 2 - grade 1 and serous collection

Grade 3 – contaminated wound with purulent collection

Results are analyzed and found that two groups are similar in cases of early and late complications .

Author concluded that choice of instrument is surgeons preference since no difference are found in present study .

Groot.G et al , department of surgery , university of Sasketelwen , Canada , conducted a prospective randomized blinded trial to determine weather electrocautery incision in abdomen and thorax increases the infection rates , study conducted for 15 months , 492 consecutively studied patients are randomized and placed in two groups .

Wound infection developed on 38 (15%) of 250 scalpel patients, and 30(12%) electrocautery patients.

Study concluded that electrocautery use for skin incision does not increases the s infection rates ,so electrocautery can be used safely used for skin incision.

Another Study was conducted in **dubin , Ireland , Keran's et al,** diathermy verses scalpel incision for hemiarthroplasty a randomized prospective trial . aim of study was to study the traditional opening using scalpel to incise all layers with diathermy incision .

50 patients with fracture of femure are recruited prospectively , All patients received prophylactic antibiotics, intra operative parameters are measured. Like time taken to open wound , wound length and wound depth , wound related blood loss, total operative blood loss.

Result of the study showed operative blood loss is 30% of blood loss in scalpel group as compared to diathermy group where blood loss is 18.5 %. No infection and dehiscence in either group are noted..

Study reccomonds use of diathermy for hip hemiarthroplasty which reduses significant blood loss and incidence of post operative wound collection . routine uuse of diathermy to make inciosion around hip is effective in reducing wound related bleeding without adverse effect on wound healing and infection rate.

Kumagai.S .G . et al , department of surgery university medical center Tucson Arizona ,conducted study study stating effects of electrocautery on midline laparotomy wound infection.

In this study they compared the healing of midline fascial incisions made with either scalpel or electrocautery and inoculated with Escherichia coli in 57 Sprague- Dawley rats. At 7 days,

tensile strength was significantly less when incisions were made with electrocautery than with a scalpel. Additionally, would strength was inversely related to the concentration of the inoculum of E coli. The use of electrocautery was also associated with more frequent bacteremia at 48 hours and higher mortality at 7 days.

Their results suggested that the technique used to incise the abdominal fascia influences subsequent wound healing, particularly in contaminated wounds.

Experimental study was conducted on rats to study the effects of incision with scalpel and diathermy . Objective of the study was to compare scalpel against electrocautery to create dermal incisions.

In the study they measured skin color , gross appearance , elevation over dermis as well as inflammatory infiltrates , amount of fibroblast and collagen deposition after 6 weeks of creation of incision.

Results showed macroscopically indistinguishable in color, gross appearance and elevation over dermis. In regard histological evaluation there was no statistical difference between incisions created with scalpel or with electrocautery.

In **conclusion**: authors stated same wound result were obtained when incising rat's skin with scalpel or with electrocautery, after six weeks of observation. And electrocautery can be safely used for skin incision

A study was conducted in porcine model , comparing wound healing characteristics in electrocautery incisions at department of general surgery Charlotte North Carolina. 18 pigs are evaluated by creating skin incision over skin , intestine , uterus using electro cautery and scalpel blade. All incisions are re approximated with absorbable sutures. Incision sites are evaluated histologically at 3 ,7 and 14 days post incision according to randomization . Skin and small intestine are compared at 7 and 14 days for tensile strength.

Results of the study stated that no differences in tensile strength of two groups . Electrocautery showed decreased overall wound healing at 3. 7 and 14 days .

Study **concluded** that even though wound healing is delayed with electrosurgical group , but overall tensile strength of wound is unaffected.

METHODOLOGY

Source of data :

60 cases undergoing hernia repair for inguinal hernia in STANLEY MEDICAL COLLEGE AND HOSPITAL, Chennai over 1 year.

Method of Collection of Data:

Study Design:

Randomized control trial. Randomization done according to lot method.

The observer will be blinded to the type of incision used and will give his observation based on the predefined criteria.

Sample Size: 60 Cases

1) In 30 cases incision is taken with electrocautery over skin.
2) In 30 cases incision is taken with conventional scalpel

Sample size has been arrived based on pain score reduction in previous study , for pain score reduction of 30% , with p value of 0.05 and power of 80% at 24hrs , sample size will be 30 in each group to get significant results.

Duration: One year

Exclusion Criteria:-

1. complicated inguinal hernia like irreducible hernia, obstructed hernia, strangulated hernia.
2. preoperative use of analgesics for > 3 days per week for >3 months.
3. Paediatric [<12 yrs] and geriatric [>50yrs]patients.
4. patients with chronic pain >3 months.
5. h/o drug or alcohol abuse
6. severe hepatic ,renal , cvs dysfunction.
7. diabetes mellitus.
8. Immunocompromised Status.

OUTCOME -

1. Postoperative pain will be measured using pictorial visual analogue scale at 6, 12 and 24 hours. If pain score is >4 inj diclofinac 50 mg im will be given.

2. During post operative period complication noted in hospital stay are measured by means of

Seroma-collection of serous discharge in suture site

Hematoma-collection of blood clots

Purulent – collection of purulent discharge

STATIATICAL ANALYSIS-

The results are finally analyzed and compared for the two groups using Mann- Whitney U Test, and percentage of type of complication at incision site are measured.

METHOD-

After taking the informed consent, patients are randomized and divided in two groups A and B .

In Group A-Incision is taken with electro cautery needle using pulse sine wave current and power setting of 70 watts. Hemostasis will be achieved with forcep coagulation.

In Group B-Skin incision is taken with scalpel , bleeding controlled by forcep coagulation using pulse sine wave on power supply 30 watts.

All standardized incision will be medial 3/5 and 2.5 cms above and parallel to inguinal ligament All the procedures are carried under standardized spinal anesthetia.

Premedication given is Cefotaxim 1 gram ,30 minutes before procedure .

Closure of the abdominal layer are done with continuous proline for external aponeurosis, intermittent vicryl for subcutaneous tissue and vertical mattress suture with 3-0 Nylon for skin closure.

Figure 4: Incision with

a]electrocautery

b]scalpel

Figure 5 : Incion wound site

a] electrocautery

b] scalpel incision

Figure 6 : Suture site in

a] electrocautery

b] scalpel group

Figure 7 : Wound Complication with

Figure 7 a] seroma

Figure 7 b] purulent collection

\

RESULTS

1.Patient Demographs

60 patients with inguinal hernia are randomized prospectively to either electrocautery group or scalpel group for skin incision . There were no significant demographic difference between two groups is noted [Table -1]. Mean age of patient in group A i.e electrocautery group is 47.8+_16.21 and in group B i.e scalpel group is 47.7+_ 13.95.

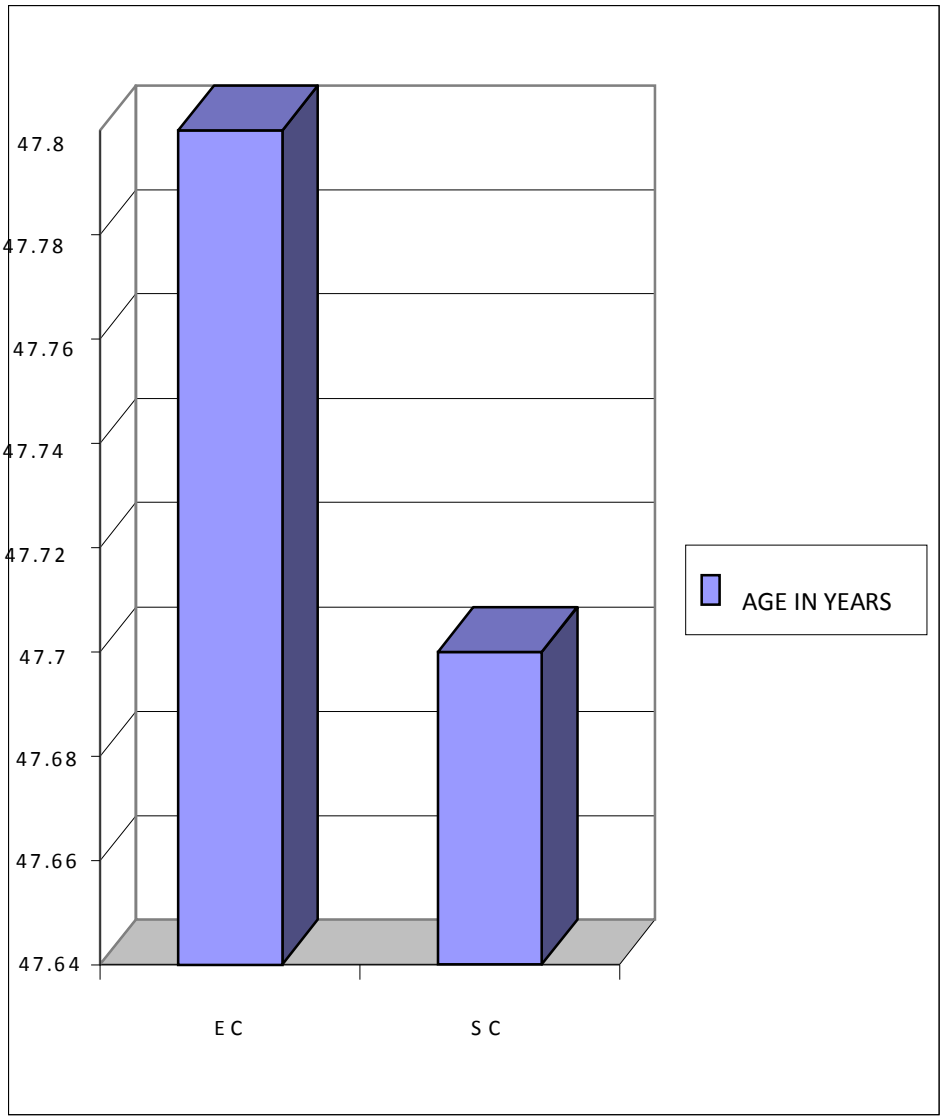
AGE

(MEAN±SD)

	EC	**SC**
Age in years	47.8±16.21	47.7±13.95

Table -1

t = 0.034 DF = 58 P = 0.97



Graph:1- Comparison Of Age Between Two Groups

2 Post operative pain.

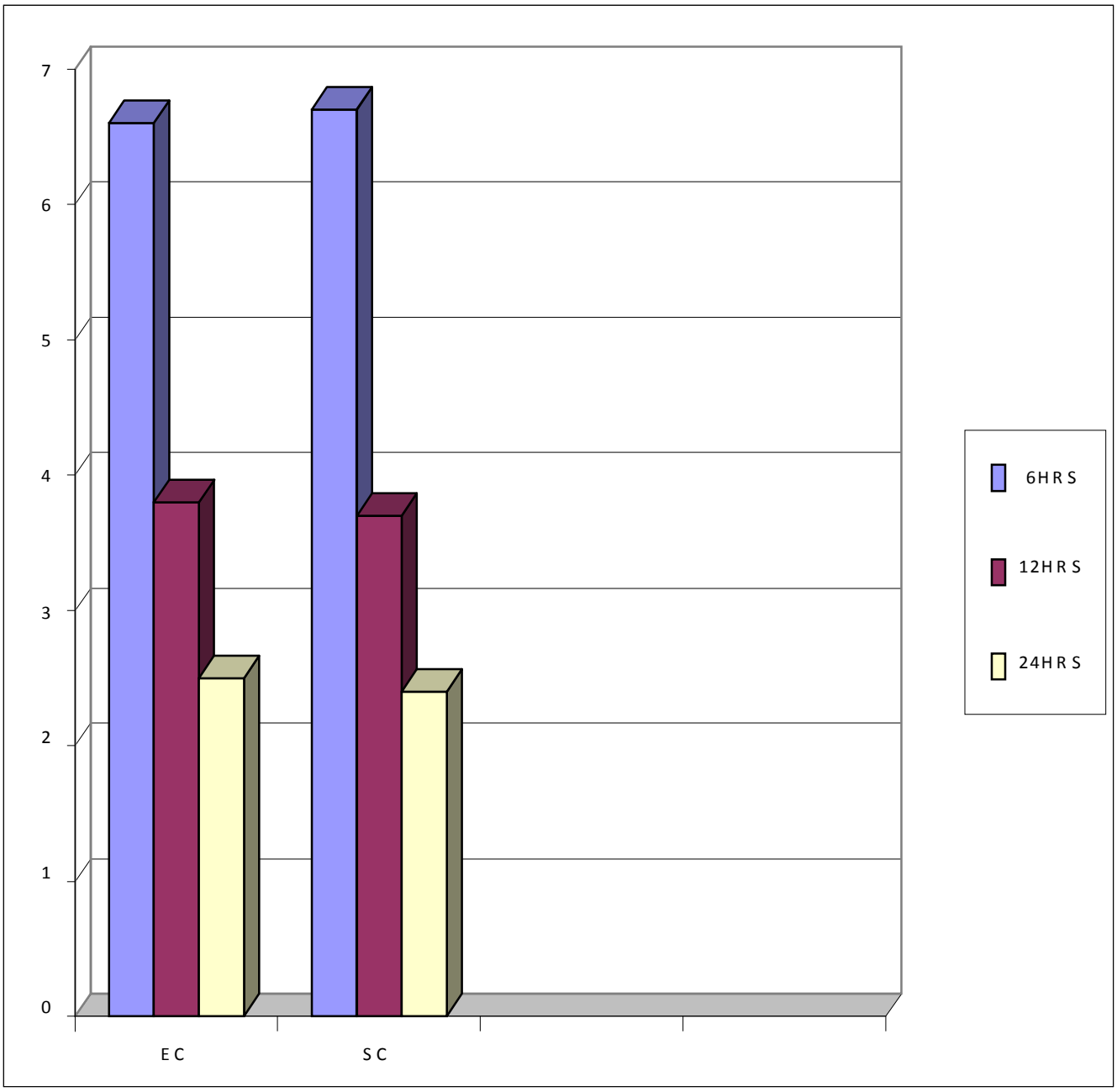
Post operative pain is assessed by visual analogue scale at 6 , 12, 24 hrs after the surgery.

In our study results are analyzed with Mann Whitney U Test.results are shown in Table 2. There is no significant difference between two groups.

PAIN SCORE (MEAN±SD)

Time	**EC**	**SC**	**Mann-Whitney U test**
6 hrs	6.6±0.81	6.7±0.53	P = 0.475
12 hrs	3.8±0.83	3.7±0.64	P = 0.556
24 hrs	2.5±0.86	2.4±0.51	P = 0.762

Table 2



Graph 2:- Comparison Of Pain Score

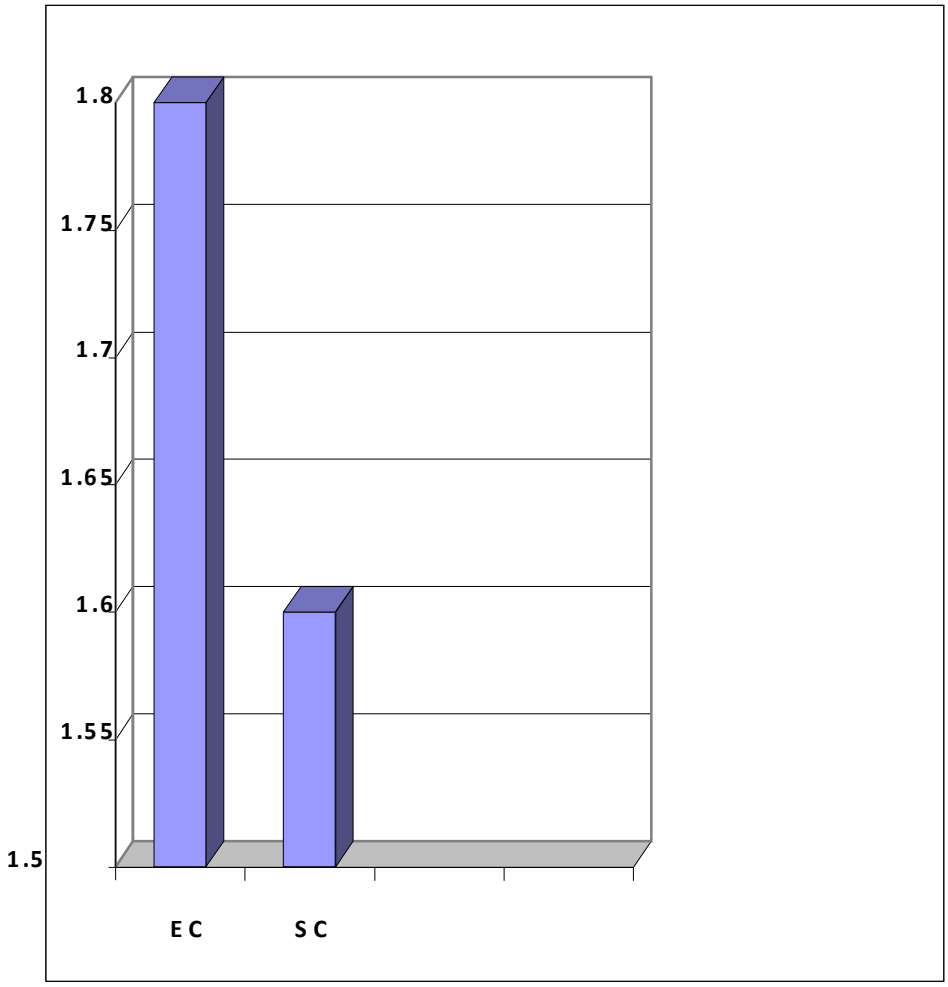
3. Analgesic requirements post operatively

Dose of analgesic i.e diclofenac 50 mg im are recorded in both groups post operatively, results are shown in table 3. Results analysed using Mann Whitney U test. Dose requirements are similar in two groups .

	Doses of analgesic (Mean±SD)
EC	1.8 ± 0.66
SC	1.6 ± 0.48

P = 0.499 Mann-Whitney U test (Adjusted for ties)

Table 3



Graph 3: Comparison Of Dose Of Analgesics

4. Local wound complications

Overall wound complications are assessed for 7 days post operatively. In our study we assessed complications like seroma .haematoma, and purulent collection . results are shown in table 4.

Table 4

A) Hematoma

Group	Yes	No	Total
EC	1 (3.3%)	29	30
SC	6 (20%)	24	30

Table 4a

X_2 with Yate's correction = 2.588 DF = 1 P = 0.108

B) Seroma

Group	Yes	No	Total
EC	9(30%)	21	30
SC	10(33.3%)	20	30

Table 4b

X_2 with Yate's correction = 0.077 DF = 1 P = 0.108

C) PURULENT COLLECTION

Group	Yes	No	Total
EC	4 (13.3%)	26	30
SC	5 (16.6%)	25	30

Table 4c

X_2 with Yate's correction = 0 DF = 1 P = 1

DF = Degrees of freedom

X2 = Chi-square

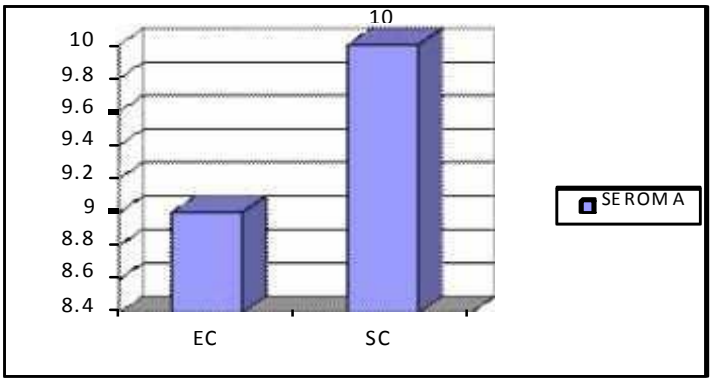
t = student's 't'

Seroma in both groups are comparable.

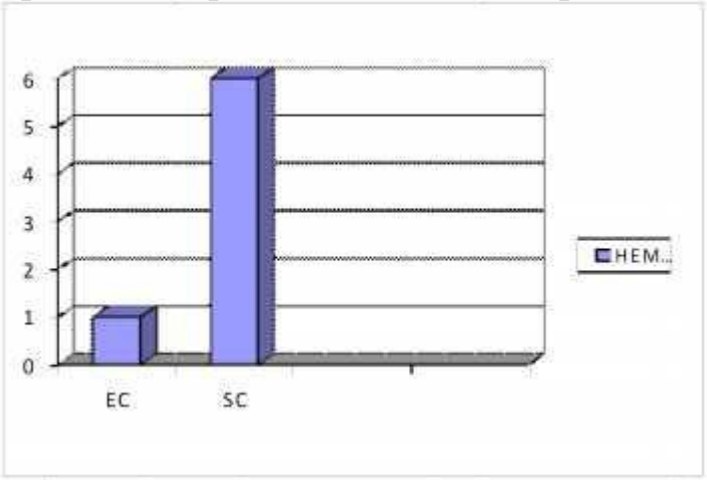
Although scalpel group shows more **hematoma** [20%],difference is not statistically significant.

Other complication i.e **purulent collection** in post operative wound are similar in two groups.

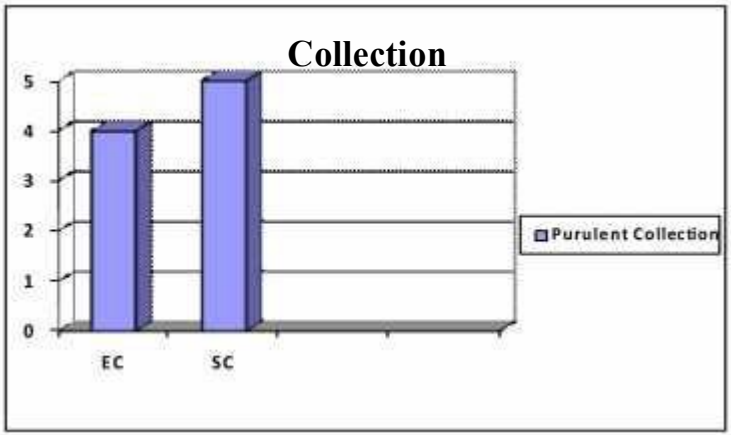
Graph 4a: Comparison of wound complication- Seroma



Graph 4b: Comparison of wound complication- Hematoma



Graph 4c: Comparison of wound complication-Purulent



DISCUSSION

Surgeons have been always in search of an ideal method of making skin incision which would provide quick and adequate exposure with minimum loss of blood. Electrocautery mainly used for hemostasis and less often for skin incision.

Earlier days when explosive anesthetics agent were in use , electrosurgical instruments had limited use because of explosive risks associated with anesthetic agents. After the invention of nonexclusive anesthetic agents like halothane , electrosurgical instruments like diathermy are increasingly used for tissue dissections except for skin incision .

This reluctance for use of electrocautery is attributed to the belief that electrosurgical instruments cause devitelisation of tissue within the wound which consequently lead to wound infection , delayed wound healing and wound scar formation.

The fear of injury tissues was first unfolded when this technique was used by Peterson in reconstructive and cosmetic faciomaxillary surgery , Mann and Klippel in paediatric surgery , Kamer in rhitidoplasty , Tabin in blepheroplasty , with minimum scarring and excellent results . skin incisions in general surgery was reported by Dixon and Watkin in patients undergoing inguinal herniorhaphy and cholecystectomy.

As mentioned above various studies were undertaken to evaluate the efficacy of electrocautery over scalpel in making skin incision and results are varying some showing better results with electrocautery some showing similar results.

In our study 60 patients are randomized in to two groups , incision is taken with either scalpel or electrocautery depending on the group allotted , and evaluated post operatively for pain , requirement of analgesic doses and post operative wound complications.

This study showed no difference between the two groups in post operative pain , analgesic requirement and wound complication.

CONCLUSION

Based on observations made in this study , it has been concluded that results of the both groups i.e electrocautery group and scalpel group are similar in relation to

1. Postoperative pain

2. Requirement of analgesics

3. Postoperative wound complications.

SUMMARY

Our study "COMPARATIVE STUDY OF EFFICACY OF DIATHERMY INCISION VERSUS SCALPEL INCISION IN PATIENTS UNDERGOING LICHTENSTEIN HERNIOPLASTY".

Total 60 patients are randomized in to two groups ,group A (Electrocautery group) and Group B (Scalpel group), skin incision in patients undergoing inguinal hernia are taken with either electrocautery or scalpel depending on their group.

Post operative pain, analgesic dose requirements and postoperative wound complication are measured. Results are analyzed using Mann Whitney U test , and Chi square tests.

Both the groups are having similar age groups electrocautery group (47.8±16.21) and scalpel group (47.7±13.95), P = 0.973. Post operative pain in both group are comparable in both the groups.

Although hematoma are seen more in scalpel group , difference is not statistically significant. Post operative seroma and purulent collection are similar in both the groups.

Although results are similar in both groups still we recommend the use of electrocautery for skin incision , as it is an alternative , attractive and easily available new method. Traditional fear of wound strength and devitelisation are not reflected in this study.

Most importantly recent increase in blood borne infections like hepatitis C , hepatitis B , human immune deficiency virus infection makes exclusion of scalpel from operative field.

On the basis of this study we recommend a wider use of electrocautery in all surgical procedures to make skin incision as this technique is quite safe.

BIBLIOGRAPHY

1. Kerans SR,Connoly EM, Namara DA, Deasy J. Randomised clinical trial scalpel skin incision versus electrosurgical skin incision in elective mid line laprotomy . BJS 2001;88:41-4

2. Chrysos E, Athanasakis E, Athanasakis S, Xynos E, Zoros O. A prospective study comparing diathermy and scalpel skin incision in tension free inguinoplasty. Am surg 2005;71(4):326-29

3. Mark A Malangoni; Raymond J Gagliardi. Hernias.In; Courtney M T, editor.

4. Sabiston Text book of surgery.19th edition.Saunders:Elsevier;

5. Chowdri NA, Wani NA, Ganai AA, Naqash SH, Peer. GQ, Wani.QA. Comparative study of scalpel skin

incision versus electrosurgical skin incision in general surgery. IJS2002;63:308-10

6. Sheikh B. Safety and efficacy of electrocautery scalpel utilization for skin opening in neurosurgery. BJS2004;18:268-72

7. Michelle Marble,Medical Devices & Surgical Technology Week editors from staff and other reports. Copyright 2001, Medical Devices & Surgical Technology Week via NewsRx.com & NewsRx.net.

8. Am J Surg, 1991 Dec, 162(6), 620 - 2; discussion 622-3 Effects of electrocautery on midline laparotomy wound infection; Kumagai SG et al

9. B.D.Chaurasia's Textbook of Human Anatomy 5th Edition

10. 10. B .Sheik et al , neuro surgery department king Faisal university Saudi Arabia

11. Study in department of general surgery Sher E Kehir institute of medical sciences Srinagar

12. 12. Franchi M et al , department of obstetrics and gynecology, university of Insubria ,Italy

PROFORMA

GROUP-

Patient Name: **Address:**

Age/Sex:

I.P.No: **DOA:**

DOD:

Chief Complaints:

1.

2.

3.

General Physical Examination:

Vital signs –PR

--BP

-RR

Any other:

Local Examination:

Systemic Examination:

1.Respiratury system

2.Per abdomen

3.CVS

4.CNS

Provisional Diagnosis:

Final Diagnosis:

Operative Procedure:

Anaesthesia: Operative

Notes: Incision taken

with— Length of incision:

Time started: Time finished:

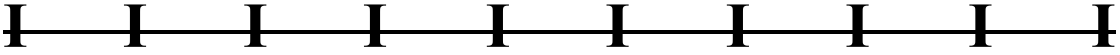
EVALUATION OF PAIN:

At 6 hours:

1 2 3 4 5 6 7 8 9 10

Dosage of analgesic given:

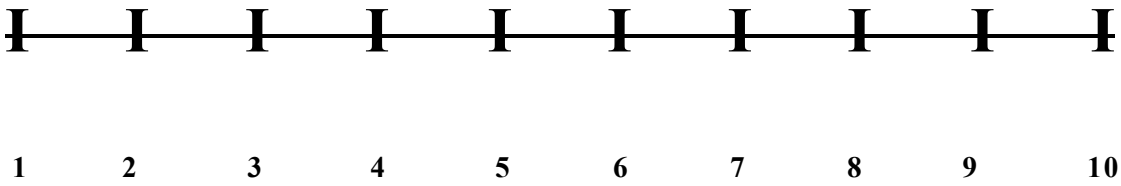
At 12 hours:



1 2 3 4 5 6 7 8 9 10

Dosage of analgesic given:

At 24 hour:



Dosage of analgesic given:

Evaluation Of Post Operative Complication-

Seroma-

Hematoma-

Purulent Collection-

Informed Consent

Name: Age/ Sex: IP:

I herewith declare that I have been explained in a language fully understood by me regarding the purpose of this study, methodology, proposed intervention, plausible side effects, if any and sequelae.

I have been given an opportunity to discuss my doubts and I have received the appropriate explanation.

I understand that my participation in this study is completely voluntary and that I am free to withdraw from this study at anytime without any prior notice &/ or without having my medical or legal rights affected.

I permit the author and the research team full access to all my records at any point, even if I have withdrawn from the study. However my identity will not be revealed to any third party or publication.

I herewith permit the author and the research team to use the results and conclusions arising from this study for any academic purpose, including but not limited to dissertation/ thesis or publication or presentation in any level.

Therefore, in my full conscience, I give consent to be included in the study and to undergo any investigation or any intervention therein.

Patient's Sign Investigator's Sign

(Dr.KUDIYARASU.M)

Information Module

You are being invited to be a subject in this study.

Before you participate in this study, I am giving you the following details about this trial, which includes the aims, methodology, intervention, possible side effects, if any and outcomes:

All patients who undergo Lichtenstein hernioplasty surgeries will be included in this study. A detailed clinical history will be taken following a standardized proforma. A detailed clinical examination will be made and relevant investigations, basic and special investigations will be done at the time of admission.Patients are informed that this study will analyze difference in scalpel incision versus diathermy incision with respect to pain and wound complications.The results arising from this study will be analyzed and used for academic purposes. You will be given clear instructions at every step and you are free to ask/ clarify any doubts. Your identity will remain confidential. You are free to withdraw from this trial at any point of time, without any prior notice &/ or without any medical or legal implications.

I request you to volunteer for this study.

Thanking You,

(Dr.KUDIYARASU.M)

Name:

KEY TO MASTER CHART

Diag : Diagnosis

RDH ; Right direct inguinal hernia

LDH ; Left direct inguinal hernia

RID ; Right indirect inguinal hernia

LID ; Left indirect inguinal hernia

B/LDH ; Bilateral Direct Inguinal Hernia

MP ; Mesh Plasty

pod ; post operative day

puru coll : purulent collection

GROUP A : ELECTRO CAUTERY INCISION

Sl No	IP NO	Name	Age/S	Diag	Procedure	Pain score		Complications			No of Analgesic		
						At 6 Hr	At 12	At 24 Hr	Haema	Seroma	Puru Coll	Doses	
1	1211994	Deva	61/	RDH	MP	9	4	3				3	
2	1323752	Shiva	18/	LI	MP	6	3	3		3rd pod		2	
3	1114688	Malaiyappa	60/	B/LDH	MP	7	5	4				3	
4	1214688	Anand	60/M	B/LDH	MP	7	5	4				3	
5	1216983	Madan	63/	RDH	MP	6	3	3		2nd pod		1	
6	1213957	Gangadharan	60/	RDH	MP	6	4	2			5th pod	2	
7	1419446	Sekar	26/	RDH	MP	6	3	2				1	
8	1420055	Parasuraman	40/	LI	MP	6	5	2			5th pod	2	
9	1221674	Subbaiya	65/	LDH	MP	7	5	4		2nd pod	5th pod	3	
10	1416391	Vasudevan	55/	B/LDH	MP	7	5	4				2	
11	1316391	Rajan	55/	B/LDH	MP	7	5	4				2	
12	1224220	Ellappan	72/	RDH	MP	8	4	1				2	
13	1424097	Mannaru	60/	B/LDH	MP	6	3	2		2nd pod		1	
14	1224097	Malayan	60/	B/LDH	MP	6	3	2		2nd pod		1	
15	1324468	Dharani	21/	RI	MP	7	4	1				2	
16	1424823	Vinayagam	22/	LI	MP	7	3	2				1	
17	1428549	Kumaran	26/	LI	MP	7	3	2				1	
18	1329811	Dinakaran	50/	LDH	MP	7	4	2			5th pod	2	
19	1330471	Laxmanan	45/	RDH	MP	7	4	3				2	
20	1433897	Iyengaran	56/	RDH	MP	5	2	2				1	
21	1434287	Hariaran	50/	RDH	MP	6	4	2		2nd pod		2	
22	1435217	Mahadevan	60/	LI	MP	6	3	2				1	
23	1435970	Senthil	35/	RI	MP	7	3	2				1	
24	1438088	Kamalan	37/	LI	MP	7	4	2		2nd pod		2	
25	1439281	Vinayak senthil	23/	RI	MP	7	4	3				2	
26	1439201	Kannan	36/	RI	MP	5	3	3		3rd pod		1	
27	1341529	Ishwaran	60/	LDH	MP	7	5	3				2	
28	1450371	Shrivastav	75/	LI	MP	6	4	3	2nd pod			2	
29	1413891	Raj	45/	RDH	MP	7	4	2		2nd pod		2	
30	1451899	Nagarajan	43/	RDH	MP	6	4	3				2	

GROUP B : SCALPEL INCISION												
Sl No	IP No	Name	Age/Sex	Diag	Procedure	Pain Score		Complications				No of Analgesic
						At 6 Hr	At12 Hr	24 Hrs	Haema	Seroma	Puru Coll	Doses
1	1423354	Vinod	65/M	LIH	MP	7	4	3	3rd pod			2
2	1323151	Veeraiyan	40/M	RDH	MP	7	3	2				1
3	1426162	Santosh	26/M	RDH	MP	6	4	3				2
4	1431032	Baalu	69/M	RDH	MP	7	3	2		3rd pod		1
5	1432793	Shivakumar	27/M	LIH	MP	6	4	3				2
6	1435206	Natrajan	40/M	RIH	MP	7	4	2			5th pod	2
7	1436184	Ganeshan	34/M	LIH	MP	6	3	2		2nd pod		1
8	1439801	Baalan	36/M	RIH	MP	6	3	2		2nd pod		1
9	1439992	Eshwaran	70/M	LDH	MP	7	4	3				2
10	1341669	Balaganesan	28/M	LIH	MP	6	4	3	3rd pod			2
11	1341068	Mahesh	55/M	LDH	MP	7	4	3				2
12	1342007	Somanathan	66/M	RDH	MP	7	4	2		2nd pod		2
13	1442861	Nagendran	58/M	RDH	MP	7	4	3	3rd pod			2
14	1443166	Ramesh	45/M	LIH	MP	7	4	3			5th pod	2
15	1343474	Manoharan	43/M	B/LDH	MP	7	5	3				2
16	1443474	Mohanraj	43/M	B/LDH	MP	7	5	3				2
17	1343658	Mahadevan	36/M	RIH	MP	6	3	2		3rd pod		1
18	1345801	Babu	62/M	B/LDH	MP	7	4	3		2nd pod		2
19	1445801	Balachander	62/M	B/LDH	MP	7	4	3		2nd pod		
20	1345105	Damodaran	56/M	RDH	MP	7	4	3	3rd pod			2
21	1345180	Shankaran	40/M	RDH	MP	8	5	2			5th pod	2
22	1446812	Anandan	55/M	RDH	MP	6	3	2				2
23	1346719	Palani	60/M	RDH	MP	7	4	3		2nd pod		2
24	1247454	Appuraj	68/M	RIH	MP	7	3	2	2nd pod			1
25	1347601	Sunil	43/M	RIH	MP	7	4	2			5th pod	2
26	1247778	Pandurangan	30/M	LIH	MP	6	3	2		2nd pod		1
27	1349037	Karthikeyan	56/M	LDH	MP	6	3	2				1
28	1251543	Ravi	28/M	LIH	MP	7	4	2	3rd pod			2
29	1252629	Vijayan	42/M	RIH	MP	6	3	2			6th pod	1
30	1254121	Chinnaiyan	48/M	B/LDH	MP	7	3	2		3rd pod		1